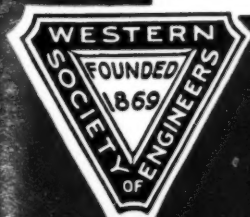


Midwest Engineer



SPRING, 1939

WE MEETINGS—PAGE TWO

APRIL, 1939

No. 8



ELEVATED STEEL TANKS

Adequate elevated water storage is a mark of a modern water distribution system. Dependable gravity water pressure provided by elevated storage improves the service rendered by a water system in several ways—gravity pressure developed by an elevated tank will maintain fairly uniform distribution pressures through periods of heavy demand; the tank can be filled by pumping when demand is least, and when electric power rates are lowest; a gravity water supply can be depended upon for pressure during temporary power failures;

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The 500,000-gal. Horton radial-cone elevated tank shown at the left was erected at Rock Island, Ill. It is 124 ft. to the bottom. Horton elevated tanks are available in capacities from 15,000 to 500,000 gals. in the ellipsoidal-bottom design, and in capacities from 500,000 to 2,500,000 gals. in the radial-cone bottom design. Write our nearest office for quotations or complete information on Horton elevated steel water storage tanks.

ENGINEERING DATA FOR ROCK ISLAND

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Miles of distribution mains—140
Daily consumption—6,500,000 gals.

Size of mains—6 in. to 24 in.
Pumping pressure—80 lbs.
Number of fire hydrants—1300

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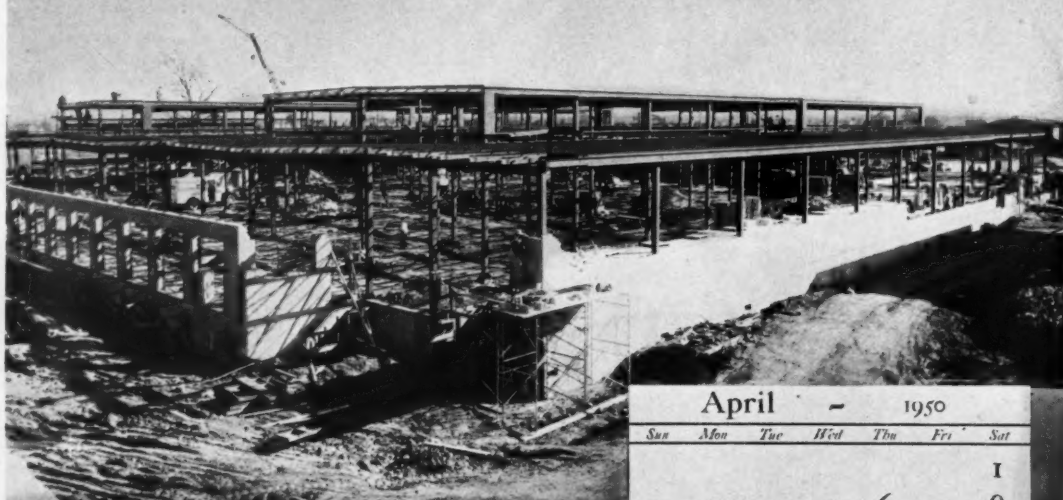
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April, 1950

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COVER CREDIT

Spring in Lincoln Park, one of three seasonal covers which
Midwest Engineer will publish each year.
Photograph by Louis C. Williams.



April 10, Air Pollution

SPONSORED BY HYDRAULIC, SANITARY AND MUNICIPAL ENGINEERING SECTION

"Air Pollution in the Chicago Area" will be the theme of a panel discussion, Monday, April 10, at WSE Headquarters.

Dr. Eugene Walsh, assistant medical director of the International Harvester Company, will discuss the physiological aspects. He is assistant professor of medicine at Northwestern University's medical school.

Prof. Robert Kintner, assistant dean of the Graduate School of I. I. T., will discuss the physical and chemical characteristics of air contaminants. He is associate professor and professor of chemical engineering at I. I. T., and received the degrees of B.Ch.E., M.S. and Ph.D. in Chemical Engineering, from Ohio State University. He is chairman of the subcommittee on air pollution, Governor's Conference on Industrial Safety, and is a member of WSE.

Kenneth M. Morse, who will discuss control of air contaminants, is chief of the division of industrial hygiene, Illinois State Department of Public Health. He is a graduate of Tufts College with a degree of B.S. in mechanical engineering, and Harvard University, M.S. in engineering, specializing in industrial hygiene. After one year with the U. S. Department of Labor developing safety and health codes, and two years with the U. S. Public Health Service as an industrial hygiene engineer in the study of industrial and environmental health problems, he came to the Illinois State Department of Public Health in 1937 as an engineer. He has been chief of the division since 1945.

James Allan, who will discuss industry and air contaminants, is manager of the industrial engineering and construction department of International Harvester Company, having charge of all construction problems, including engineering pertaining to the prevention of occupational diseases in the plants, and advice and counsel with all the plants in regard to operations that may emit fume, smoke, vapor, dust, etc., into the outside general atmosphere. He has been a member of the Chicago Association of Commerce and Industry, Cleaner Air Committee since its organization.

April 12, Professional Women's Council

Dean Ovid Eshbach, Technological Institute, Northwestern University, will speak Wednesday, April 12, on "Technical Education for Women." All members of the society are invited to attend. See story on page 19.

April 17, Stress Analysis

SPONSORED BY MECHANICAL ENGINEERING SECTION

August J. Durelli, Research Engineer, Armour Research Foundation will speak Monday, April 17, on the subject, "Stress Analysis." He will discuss new developments and criteria to use the several methods.

After giving an over-all picture of the field, Durelli will explain some new developments in photoelasticity, brittle coatings, and brittle material methods. In the last two years a great effort has been made at Armour Research Foundation to go deeper into the fundamentals of these methods and at the same time to find easier and faster ways to use them in industrial applications.

He received the doctorate in engineering at the University of Paris, was a Guggenheim fellow at M.I.T. in 1940, and visiting professor at the Polytechnic school in Montreal in 1943.

April 25, Consulting Engineers

The annual meeting of the Consulting Engineers Division will be held Tuesday, April 25, at noon. This will be a luncheon meeting for which special reservations must be made.

Carl G. Gardner, executive director of the Chicago Plan Commission, will speak on the subject, "Properties Affected by Future Highways in Chicago."

April 27, Thursday, Communications

A joint meeting of WSE and the Chicago Section of the AIEE will be held Thursday, April 27, in the Bell Forum, 311 W. Washington St.

The speaker will be Dr. J. O. Perrine, assistant vice president of the American Telephone and Telegraph Company. His subject will be "More Waves, More Words, Less Wires."

By means of specially developed equipment an audible and visual demonstration will be given.

Wednesdays, Building Code Seminars

Sponsors of the seminars on the Chicago building code, including WSE, have announced the following schedule for the remaining sessions:

April 5, Moderator E. Merrill; Chapters 53, 54, 55—Institutional units, assembly units, outdoor assembly units.

April 12, Moderator A. Epstein; Chapters 58, 59, 60—Industrial units, hazardous units, storage units.

April 19, Moderator V. O. McClurg; Chapters 68 thru 74—Minimum design loads; materials, methods & tests; foundations; masonry construction; wood construction; reinforced concrete construction; steel and metal construction.

April 26, Moderator R. Bennett; Chapters 75 thru 78—Safety requirements, safeguards during construction, use of public property, existing buildings.



CTA

PROBLEMS AND POLICIES



By Ralph Budd, Chairman, Chicago Transit Board

The Chicago Transit Authority represents a unique experiment in the application of much the same philosophy that underlies the Interstate Commerce Act by which rail transportation is provided to the nation. In both cases the purpose is to obtain the best in the way of service at the lowest cost consistent with safety and dependability. In both cases the service is to be provided at cost but in order to insure that fares will not be excessively high, certain concessions are made in the case of the Chicago Transit Authority, chiefly the freedom from taxation of its property and earnings, as well as of the income from its bonds. It is unique, however, for a very large city to provide that local public transportation shall be supported and improved out of earnings without any further aid in the way of a subsidy.

While the intention of the Federal Act as regards railroad transportation is that

rates will be charged which will afford an opportunity to earn a fair return on the property devoted to public services, there is no guarantee that such return will materialize. In the case of the Metropolitan Transit Authority Act, however, Section 30 provides that the Chicago Transit Board shall fix rates, fares and charges for transportation which shall at all times be sufficient in the aggregate to provide the necessary revenues to sustain service and carry out modernization.

I have never seen a law more specific than the Metropolitan Transit Authority Act in outlining the policies to be followed by those entrusted with its administration.

Three broad policies are spelled out for Chicago Transit Board to follow. First, the Board is charged with the duty of consolidating the properties acquired from the Chicago Surface Lines and the

Chicago Rapid Transit Company, as well as other properties that the Authority may acquire in the future. Consolidation imposes upon Chicago Transit Board the obligation to eliminate unnecessary and wasteful duplication of services that were built up over the years when CTA's predecessor companies operated as two separate, competing local transit systems. Implicit in these requirements, of course, is efficient, economical, unified operation of all CTA properties.

Second, the Metropolitan Transit Authority Act requires Chicago Transit Board to modernize both equipment and service as expeditiously as possible. For years preceding the CTA, the two companies had been unable financially to purchase any appreciable amount of new equipment. At the time of the take-over by the CTA, the average age of streetcars it acquired was approximately 32
(Continued on Page 4)

CTA Problems And Policies

(Continued from Page 3)

years; trolley buses, 15 years; gas buses, 5 years; and "L"-subway cars over 40 years.

In 1907, having received a 20-year franchise from the City of Chicago, the Chicago Surface Lines had undertaken an extensive equipment purchasing program. Before the end of the franchise period, however, equipment purchases had dwindled to a trickle because the uncertainty of a franchise renewal prevented the company from attracting necessary new capital. From 1927 to 1947 the Surface Lines had no franchise. The Chicago Rapid Transit Company, being considerably weaker financially than the Chicago Surface Lines, had purchased even less new equipment. Its last car-fleet purchases were in 1925 and 1926, and then only 456 units were bought.

Third, the Metropolitan Transit Authority Act requires Chicago Transit Board to do all of the things necessary to consolidate and modernize the properties almost wholly out of fares paid by the riders. A relatively small income is received from concessions and tenants. The power to levy taxes to pay any part of the cost of operations was deliberately and intentionally withheld from the CTA by the state's law-makers.

Membership of Board

Administrative agency of Chicago Transit Authority is Chicago Transit Board, consisting of seven members, four appointed by the Mayor with the advice and consent of the City Council, and three by the Governor of Illinois with the advice and consent of the Senate. Appointees of the Mayor shall be approved by the Governor, and appointees of the Governor shall be approved by the Mayor.

The terms of the initial members ranged from one to seven years. Succeeding members are appointed each for a term of seven years.

All members of the Board are men of business experience, as is required by the terms of the Act. The Board, in accord-

ance with the provisions of the Act, has appointed a general manager of ripe experience and ability to direct the Authority's extensive operations.

The Authority has about it many of the characteristics of private enterprise. It was, for instance, set up in business by private investors who bought the Authority's issue of \$105,000,000 of revenue bonds. And, just as in any private business, to remain solvent, the Chicago Transit Board and the management must earn enough to meet operating and maintenance expenses, and to service its bonded indebtedness.

There exists on the part of the Board and other officers and members of the staff—yes, I think I may say on the part of all employees—a deep consciousness of their responsibilities and a vigorous determination to make of the CTA a success that will compare favorably with notable successes in the field of purely private endeavor. CTA is being operated on a sound, efficient, business-like basis. Its excellent management staff compares favorably with the best I have observed in privately owned carriers.

Admittedly the responsibilities and duties of the Board are heavy. The legislature recognized this fact by clothing the Board with broad and unusual powers so that it can operate the Authority in the efficient, economical manner required to establish and maintain the Authority's credit. Without good credit we cannot hope to succeed. The powers granted include the exclusive rights to regulate CTA services, and to fix rates of fare sufficient to pay operating and maintenance expenses, and fixed and other charges.

On the goal that we seek to attain—modern, attractive and convenient local transit for metropolitan Chicago—there is general agreement. Everyone concedes that it is urgently needed, but not everyone will agree on the steps that are necessary to achieve it.

To some individuals, actions by the Board will appear arbitrary. Consequently, in the exercise of its broad powers, the Board is proceeding cautiously and conscientiously. Every action is carefully considered and weighed in the light of its effect upon the objective set for the Authority by the Metropolitan Transit Authority Act. The greatest good for the greatest number is our guiding rule. No other course can be pursued by the

Board if it is to avoid giving substance to charges of misuse of its powers.

In the comprehensive transportation plans for the City of Chicago proposed by many engineers over a period of years, but more specifically outlined in the so-called Green book prepared in 1937 under the direction of Messrs. Philip Harrington, Maj. R. F. Kelker, Jr., and Charles DeLeuw, it was basic that the elevated and surface operations should be consolidated and placed on a non-competitive basis. When the Chicago Transit Authority came into being, one of its main purposes was to carry out such a plan. This involved the double problem of unifying these two properties from the standpoint of plant, personnel and organization and of functionalizing the two services so that they will complement rather than continue to compete with each other.

Unification Proceeds

The unification process has been a gradual one starting from the top. By having a basic plan of organization and coordinating the reorganization with the normal separation of high-ranking personnel from CTA service by pension, and through illness and death, all departments, by about April 1, 1950, will be so merged that there will be no separate rapid transit or surface division department heads. By April 1 every head of a department in the CTA will have been a CTA appointment, made in the course of normal organizational changes without any former department head from either company having to become assistant to the department head of the other company.

This has enabled two organizations, which formerly were highly competitive, to weld at the top without serious clashes of personalities. There are still many problems of coordinating activities in the organization below the upper echelon, but by being very careful in making all promotions and transfers on the basis of merit and fitness, these duties are being gradually coordinated and consolidated without injury to organization morale. It has been very fortunate that these changes have moved forward so rapidly and smoothly, considering the fact that on October 1, 1947, there was one person from each organization for each job in the upper level of the organization.

There have been two approaches to the consolidation of the two properties servicewise; first, the elimination of wasteful duplication and, second, the coordination of the services. In eliminating duplication, it was the policy to place the former rapid transit train operations on an express basis and the surface operations generally on a local basis. For the rapid transit operations, this meant the elimination of many stations which were very lightly used but which materially interfered with speedy train movements. In every case where elevated stations were eliminated local services on the surface system were available, either for the complete ride or as feeders to the rapid transit system. Additional stations of intermediate use were placed on a skip-stop schedule. All of this was done to put the rapid transit on an express and non-competitive basis as well as to give vastly improved service to the great majority of users.

A program has also been started to coordinate more closely the services—as, for example, the direct motor coach service on Western Avenue to the elevated station of the Ravenswood branch at Western Avenue where the bus makes undershelter pick-up and delivery of rapid transit passengers.

Programs Affect People

All of these programs, with respect to both organization and service, affect people. People resist change even though a very small minority may be affected. Small minorities have a way of amplifying these changes so that they sound upsetting. The whole program, however, is designed to be of ultimate benefit to the overwhelming majority of both the public and CTA employee groups.

Within the last few weeks, criticisms of CTA service have been published in the newspapers as interviews with CTA riders. Let's take at face value all of these interviews, and, for the sake of discussion, try to analyze the reasons why these riders believe and assert that service has deteriorated under the CTA.

Chicago Transit Authority has had a considerable amount of praise for the all-express, north-south elevated-subway service established last August. It has been told by many people that the speed of operation and the skip-stop arrangement have substantially improved serv-

ice. The same is true of the all-express, skip-stop service established in April, 1948, on the Lake St. "L".

Consequently the CTA has been encouraged to believe that it has come closer than ever before to the long-sought goal of real rapid transit for Chicago through the changes it has made in elevated-subway service.

Most of the complaints received by the CTA, and most of those recently published by the newspapers, have been against CTA surface operations.

It is a singular situation that the CTA's surface system should be bearing the brunt of public criticism. The surface system is where the CTA has concentrated its modernization efforts. Since the start of the modernization program, the CTA has spent more than \$40,000,000 for modern streetcars, buses and other facilities for its surface system. It has bought and is now operating a total of 1,710 modern streetcars and buses, an achievement unequaled in a similar period of time in the history of local transit in Chicago. Today more than 50 per cent of each weekday's originating surface rides start on modern equipment.

The elevated-subway presently has no new equipment, except four experimental cars, yet it is most frequently commended by CTA riders.

How, then, could it be that service of the surface system has deteriorated, as charged by the CTA's critics?

Could the reason be that our streets, in the central business district and in the outlying business centers, are so tightly jammed with freight trucks, automobiles, streetcars and buses during the heavy travel periods of the day that mass transit vehicles cannot maintain schedules?

The most recent cordon count of traffic, taken in May, 1949, showed that automobile and truck traffic entering and leaving the central business district was at an all-time high. It has been steadily increasing. A similar situation prevails in the outlying business centers. On a typical weekday (from 7 a.m. to 7 p.m.), according to cordon count, more than 161,000 private automobiles and more than 22,000 trucks entered the central business district, and a slightly lesser number left the central business district. Other statistics disclose that automobile ownership is also at an all-time high, having advanced nearly 100,000 from the previous peak of 549,500.

Consequently automobile use is at a record level.

Could it be that city streets are not being efficiently used for the transportation of people and goods? That too many vehicles are tied up in traffic too much of the time, instead of keeping on the move?

The private automobiles entering and leaving the central business district carry an average of only 1.7 passengers each, according to traffic engineers. These observers also report that a large number of freight trucks make deliveries and pickups in the central business district at times when street capacity is most urgently needed to get people to and from their places of employment.

During these periods, truck and automobile traffic overflows to the streetcar tracks, and the streetcars, being confined to a fixed right-of-way, can neither go around nor go through the traffic jams that are created. Even the more flexible buses can make but slightly better progress through congested streets. Autos do not keep to the left of safety zones but use the streetcar's loading space, and hold the cars back where they must stand helplessly.

Could it be that some, or all, of these factors constitute the key to an accurate determination of the circumstances that lead some riders to say that CTA service has deteriorated?

Could it be that what has been represented as a disease is actually only the symptom, and that the cause of the trouble lies deep?

Traffic Major Handicap

Since traffic congestion unquestionably is one of the major problems handicapping CTA operations, it seems to me that the old saying, "The way to cure trouble is to cure the cause," fits our situation quite aptly.

Could it be, then, that the CTA is not actually at fault?

Its modernization program to date has given local transit riders more new equipment than in any similar period in the city's history. It has made a substantial start in giving Chicago real rapid transit, and it will further improve rapid transit service in the near future by placing in operation a fleet of 130 modern, streamlined all-metal subway-elevated cars.

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CTA Problems And Policies

(Continued from Page 5)

Could it be that the CTA is confronted with a situation, inherent in this machine age, that even its skilled local transit operators can solve only with the close cooperation and assistance of other agencies?

The City authorities recognize that traffic congestion may be the crux of the CTA's problem of maintaining service on schedules. I was very glad that Mayor Kennelly, a few days ago, took positive aggressive action to correct the traffic situation. He has appointed an excellent committee to study the traffic congestion. It is to report and recommend, within sixty days, immediate and long-range steps that are necessary to clear our streets of avoidable blockades. The committee is to study all of the factors that affect the flow of traffic in and through the central business district, and to devise and recommend corrective measures. This is the kind of cooperative action that I am confident will produce results of far-reaching benefit to business, to industry, to motorists, and to local transit riders. Chicago Transit Authority is represented on the committee and will do its utmost to cooperate with the Mayor and the other organizations represented on the Mayor's committee to produce and put into effect a plan that will make the best possible use of the streets, one that will keep the traffic on the move. Certainly the traffic situation in the central business district and in many of the outlying business centers demands immediate attention and action. In the rush hours of the day, traffic barely crawls through these areas.

In its traffic miseries, Chicago does not lack company. All other large cities, and many smaller communities, are confronted with the same situation—streets jam-packed with traffic. Everywhere the problem is to restore the streets to their primary purpose—the transportation of people and goods.

The nation-wide aspect of the traffic problem is emphasized in a report just received from W. C. Gilman & Company of New York City, consulting engineers employed in conformity with the requirements of the trust agreement cover-

ing the Transit Authority's \$105,000,000 bond issue.

This report asserts that traffic conditions in all large cities are such that drastic curtailment of inefficient street use is imperative to civic welfare and progress. In this connection the report makes the point that special consideration must be given to mass transit vehicles, each capable of transporting 45 to 90 passengers, because they are the most efficient users of street space, especially during the rush hours.

The CTA's equipment modernization program, which contemplates the expenditure of \$150,000,000 for modern equipment and facilities by 1957, unfortunately was at a standstill throughout 1949, due to lack of funds. The CTA did, however, spend approximately \$5,000,000 during the year for imperatively needed new facilities, such as shop tools and equipment, overhead power line installations, off-the-street terminals, and the new bus garage at 103rd and Vincennes Ave.

At the close of 1949, CTA was approximately \$9,700,000 behind the over-all modernization program schedule, having expended \$42,445,000 of the total of \$52,125,000 scheduled to have been spent as of December 31, 1949. Here are the expenditures for new cars and buses as of December 31, 1949 as compared to the scheduled program:

Modernization Program			Annual Purchases	
	Number of Vehicles	Estimated Cost	Number of Vehicles	Actual Cost
Streetcars	600	\$14,149,000	600	\$15,019,000
Motor Buses	965	12,672,800	900	13,386,000
Trolley Coaches	210	3,427,000	210	3,736,000
Rapid Transit Cars	184	9,400,000	4	511,000
				756,000*
	1,959	\$39,649,300	1,714	\$33,408,000

(*Includes partial payments of \$756,000 on the 130 rapid transit cars on order but not included in this tabulation.)

For new rolling stock, as indicated by the above tabulation, Chicago Transit Authority has expended a total of \$33,408,000, including payments in 1949 on the \$4,700,000 purchase price of the 130 new elevated-subway cars. Delivery of these cars, which are for the Milwaukee-Dearborn-Congress subway, is expected to start next April. The

new subway is to be ready for operation late this year.

It would be unfortunate if CTA had to hold off purchasing new equipment until it has accumulated sufficient earnings and depreciation reserves to pay in advance the full cost of equipment that is urgently needed. CTA, however, may be able to follow the procedure used by the railroads in their recent and continuing extensive acquisitions of new equipment which involve a small initial payment and the balance in serial installments while the equipment is being used. They are able by economies in operation of new equipment to save more than its cost before it is worn out. The same opportunity is open to the CTA when suitable credit is established.

The CTA's problem is the same, in many respects, as the problem other transportation agencies are experiencing. The question is whether rates that are feasible can maintain a proper standard of service—this includes modern equipment, of course,—without a direct subsidy. The basic theory of the Metropolitan Transit Authority Act is that modern and attractive service can be attained and supported entirely from the fares collected from riders by giving the Authority exemption from taxation on its properties, on its revenues, and on the income from its bonds. In my opin-

ion, there is no better place than Chicago for a fair test of this theory.

There is reason to believe that we can before long accelerate the modernization program, and, if circumstances are favorable, meet the originally contemplated schedule of the program.

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Naval Communications Using Very Low Frequency

Rear Admiral John R. Redman, USN
Chief of Naval Communications

Presented before the Western Society of Engineers and the
Armed Forces Communications Association, February 20, 1950

Chairmen, members, and guests of this combined meeting of the Western Society of Engineers and the Armed Forces Communications Association: I am honored to have been invited here.

Much has been said and a great deal has been printed on the progress of unification. It has seemed to me that most recent addresses on communications have been closely related in one way or another to the unification problem. I think it will suffice at this time to say only that those of us connected with joint military communication problems feel that we lead the field in cooperation, trust, coordinated efficiency and a real effort to prevent useless expenditure of the taxpayers' dollar.

In casting about for something different and somewhat unique to the Navy, I selected the development of high-powered low frequency and very low frequency in naval communications as a possibility that would interest you.

I hope that my brief talk will help you to recall some of the landmarks and milestones of progress in communications and bring back some pleasant memories.

* * *

Communications have progressed so rapidly during the past half century that many of us find it difficult to remember some of the old reliable LF and VLF landmarks that served us so well.

It is with a distinct feeling of pride that I am able to tell you about the Navy's interest and some of its accomplishments in the field of LF and VLF radio.

About forty-seven years ago (back in the years of 1902 and 1903) you will recall that "wireless" was becoming increasingly popular in the United States. During 1901, the Navy made its first wireless installation on a battleship. During 1902 the Navy established its first wireless test stations on shore at Annapolis, Maryland and Washington, D. C., 30 miles apart. These stations were established to test the German-made,

Slaby-Arco and Braun Siemens-Halske sets, the French-made Rochefort and Ducrot sets, the English-made, Lodge-Muirhead sets, and the American-made DeForest sets. During the year 1903 five different systems of wireless were being actively tested in the U. S. The potential value of a reliable wireless system appeared to be just what the Navy needed, so it is not difficult to understand why the Navy would be right in the middle of these tests. The systems then being tested were: the Marconi system by the Navy, the Slaby-Arco system by the Navy, the Braun system by the Navy, the Fessenden system by the Weather Bureau.

In the last of the year 1903 the Navy's tests had progressed to the extent that seven ships and five shore stations were fully equipped with wireless apparatus and operators furnished for service use.

In the year 1909, after having conducted tests for almost a decade, using varied equipment of American and foreign manufacture on shore and between shore stations and ships, the Navy entered into a contract for its first 100 kilowatt transmitter, a Fessenden synchronous rotary spark, for installation at Radio Virginia, now better known as "NAA" at Arlington, Virginia. This high-power transmitter was first installed at Brant Rock, Mass., during 1910 for experiments with the Bureau of Standards "Wireless Laboratory" in Washington. This transmitter was later installed at Arlington where it helped make "NAA" famous.

At this point, before continuing further on an historical review of the LF and VLF field, I should like to digress for a moment to describe briefly the fundamental concept of communications which has been evolved in the Navy. This will demonstrate why our interests have been focused in that field.

The basic requirement which naval communications must satisfy is the ability to communicate with mobile forces at sea, in the air, or wherever they may be. This requirement is satisfied by three elements of our naval communications system: the Fox broadcast to ships at sea and for which both VLF, LF, and HF facilities are used; ship-shore terminals at major stations by which traffic from ships can enter the system; and finally, the point-to-point circuits by which the major radio stations are linked.

You will recognize that through the medium of these three fundamental elements of our system, communications can flow to and from our commanders afloat or ashore, and the forces which they control. Additionally, of course, there are other smaller coastal stations which provide local ship-shore services, and there are other elements of the naval communication service with which we are not particularly concerned here.

The Fox broadcasts are provided at strategically-located communications stations to assure almost complete worldwide coverage by the broadcasts. With this system a degree of security to the mobile forces is afforded since they can receive traffic without having to use their transmitters.

(Continued on Page 8)

Naval Communications Using Very Low Frequency

(Continued from Page 7)

From the very beginning of the Navy's interest in the infant "wireless" it was recognized that one of our major problems would be the ability to communicate with ships at sea. Hence, the very strong emphasis which we have given to broadcast methods employing LF and VLF facilities.

I am sure that you are all well aware of the characteristics of radio wave propagation at the high frequencies, how they can be reflected, directed, and generally made to conform to various patterns of coverage, skip distances, fading, etc. There is, of course, no reason for me to say anything about those wave lengths. However, to give you an insight as to the Navy's fundamental need for VLF facilities, I must point out the essential non-directivity of frequencies in the LF and VLF bands. The United States, as you know, is bordered on the east, west, and for a great part, the south, by enormous bodies of water.

VLF Vital in War

In wartime, naval action may involve an entire ocean as a single far-flung theater of coordinated combat by several fleets or forces acting together as a team to inflict crippling or destructive blows on the enemy. It may even be the scene of lonely convoys far from the normally traveled sea lanes with their vital cargoes of munitions or raw materials without which the industry of the country and the Armed Forces cannot guarantee victory. Such a dispersion of forces must conceal their identity by not using their own radio. It is for this and other tactical reasons that we must have very strong non-directional stations on shore which are not readily susceptible to jamming by the enemy. VLF fills this requirement.

Now to resume our review of LF and VLF development.

While the Arlington station was under construction, the Navy was busily engaged in the preparation of plans for what was to become its first chain of high-power radio stations to connect these "strategic" and "coastal" stations into an integrated system and to function as extreme range broadcast stations.

Highly satisfactory results were obtained on the circuits between "NAA" Arlington and the Panama Canal Zone, using the Fessenden 100 kw synchronous rotary spark transmitter. As a result of this, and knowledge of the success the Germans had realized, the Navy modified its program to install much greater power at the other stations proposed for its chain of high-powered long-wave stations.

The German stations, constructed about 1911, utilized alternator-type equipment at Tuckerton, N. J., and Eilvese, Germany, and arc-type transmitters at Sayville, Long Island and Nauen, Germany. In retrospect it was evident, when the first World War broke out, that these stations were built to meet Germany's needs of the hour.

It was along about this time that the Navy accelerated its program for construction of planned high-power long-wave stations. This program was soon to bear fruit in the commissioning of the following stations:

- NAA, Arlington, Va., 100 kw spark, 1913
- NAX, Colon, C.Z., 100 kw spark, 1914
- NBA, Darien, C.Z., 200 kw arc, 1915
- NPM, Pearl Harbor, 300 kw arc, 1916
- NPL, San Diego, 100 kw arc, 1917
- NPG, San Francisco, 100 kw arc, 1917
- NPO, Cavite, P.I., 350 kw arc, 1917
- NSS, Annapolis, Md., 350 kw arc, 1918

The Tuckerton and Sayville stations were very fine stations and were taken over by the Navy during 1915 to preserve the neutrality of the United States during World War I. Many of you will recall the rhythmic dah-dit dah-dit-dit call of the Sayville station which the Navy continued to operate for many years for broadcasts to the fleet.

On April 6, 1917, the United States found itself forced to enter into the first World War. As a result it was necessary for the government to take over almost all commercial radio stations then existing in the United States. One of these was the Marconi station at New Bruns-

wick, N. J., which featured both wireless and radio-phone service. New Brunswick became Navy station "NFF," and when the 200 kw alternator was installed during the winter of 1918, "NFF" became the most powerful transmitting station in the world. Navy ships in all parts of the world could hear "NFF" and so could field receivers on the battlefield in France. It was from the lofty aerials of "NFF" that President Wilson's Fourteen Points were transmitted to Germany and received at Nauen.

In 1918 when the fighting in Europe was over, the United States found itself faced with a problem of maintaining contact with its occupation forces. It was for this purpose that an agreement with the French government was concluded whereby the U. S. Navy would construct a high-powered long-wave station in France. Work on this station was started in May, 1918, and Radio Lafayette, near Bordeaux, France, the world's first 1000 kw long-wave radio station was completed and placed in operation during August, 1920.

This station was more than double the strength of any predecessor and achieved world ranges with a wavelength greater than 20,000 meters. The original installation comprised two 1000 kw Federal-Poulson arc transmitters. It was the Lafayette station and a similar installation of two 350 kw arcs at Annapolis, Maryland, which maintained the reliability of transatlantic communications for the American occupation forces.

Postwar Expansion

Almost immediately after the war American and foreign communication companies were feverishly engaged in the establishment of world-wide communication systems for both governmental and commercial purposes. The history of achievements in the field of communications during this period is particularly rich in its recording of American accomplishments. Hardly a paragraph fails to cite an American contribution to the art.

As you know, it was not many years after World War I until the spark-and arc-type transmitters were declared obsolete. Faced with this problem American manufacturers came through with another accomplishment for the Navy. It developed an 80 kw vacuum tube

transmitter which was installed at San Diego, California during 1926. This transmitter was never found wanting and was functioning very satisfactorily on 30.6 kilocycles until it was retired during 1949 in favor of one of its more modern successors.

The Navy was gratified by the success of this first high-powered vacuum-tube-type long-wave transmitter and in subsequent years, when it became necessary to replace the arcs with more modern equipment, a contract was awarded to develop the first really high-powered vacuum tube transmitters. The first of this famous line of transmitters, constructed by the General Electric Company, was installed at Cavite, where its voice, the famous old "NPO" was heard the world over from 1932 until it was destroyed by the Japanese in December, 1941.

Although not without many perplexing problems the Cavite installation was very successful and much valuable information not previously available was obtained. The other three transmitters, which were procured about the same time, were installed in rapid succession at Pearl Harbor, Summit, Canal Zone, and Annapolis, Md.

The installation at Pearl Harbor was first made at the Navy Yard using the same towers as were previously used for the 300 kw arc transmitter. It was soon learned that much greater efficiency would be realized by removing the station to a more remote site where a larger antenna could be erected. This was done and the new site at Lualualei was soon acquired where seven great self-supporting steel towers, whose lofty heights reach 610 feet toward the clear Hawaiian skies, were quickly erected to support an antenna system especially designed for the pride of the Navy's high-powered long-wave radio transmitting stations.

With minor exceptions similar plans and installations were soon undertaken for the Canal Zone and Annapolis facilities except that the Annapolis transmitter was originally purchased as a 500 kw set.

Time and experience continued to show that we had not yet obtained the most desirable VLF coverage. As a result the following years saw the Annapolis station fully commissioned and the Lualualei station boosted to a rating of

five hundred kilowatts, at that time the most powerful vacuum tube transmitter station in the entire world.

It will be of particular interest to you to know that, although the giant of Cavite was permanently disabled by the Japanese, its big brother in the Hawaiian Islands was not found wanting. It was operated at almost full power for more than twenty-one months and during this time it averaged more than twenty-three hours and fifty minutes actual transmission for each and every day. The manufacturer and the Navy are both proud of this performance.

Many Still Active

These installations are continuing their important role.

Although the Navy has replaced all its old high-powered spark and arc transmitters, all of them are not yet idle. The 200 kw arc transmitter previously installed at San Diego is continuing its valuable service to the nation at the University of Southern California, to whom it was given for research purposes.

Although development of the vacuum tube made it possible in general to replace the spark, arc, and alternator-type transmitters with more versatile equipment, many of the higher-power alternators still, like old man river, just keep rolling along. During World War II the Navy leased and operated high-powered alternator stations at Rocky Point, Long Island, New Brunswick, N. J., Tuckerton, N. J., and Bolinas, California. They were never found lacking when needed.

During World War II the Navy also "purchased" two of these alternators from the Radio Corporation of America. I would like to tell you something about their installation and operation by the Navy.

The first of these two alternators purchased by the Navy was installed in Haiku Valley on the Island of Oahu to augment the services being rendered by the Lualualei 500 kw transmitter.

The Haiku valley site was selected as the result of extensive surveys to locate a site that would, if possible, eliminate the need for constructing very large steel towers. Because of the heavy demands for steel for other purposes it would have been an almost impossible task to procure enough steel to build the required

towers. We were very fortunate. Haiku filled all the requirements and it was not long until construction was well underway—not without great difficulty though, I assure you, because it is no easy task for workmen to get to the heavily forested and remote mountain tops on Oahu. Nevertheless when the job was completed we had a very fine catenary antenna system suspended between the "Kahuku" and "Pali" mountain peaks of Haiku Valley.

This system consists of four separate catenary strands each of more than seven thousand feet in length. The downleads from these catenary strands drop more than 1300 feet to the transmitter building in the valley below.

To the casual observer these downleads seem to continue straight upward on an endless ascension to the blue heavens above. Even those intimately familiar with Haiku often had considerable difficulty in sighting the catenary strands which spanned the valley.

The Haiku alternator, although already a grandfather, was more than gratifying in its new job of working for Uncle Sam's fighting machine.

The second alternator was intended for installation on Guam. However, the Japanese surrendered before this installation had progressed very far and it was brought back to Hawaii and installed in the familiar presence of its twin brother at Haiku, where it also defies the years and stands ready to roll again for Uncle Sam on a moment's notice.

Industry Contributes

To cover the entire evolution of LF and VLF radio would require much more time than we have available. Therefore, I have tried to touch on a few of the better known highlights. In any event, anything I might say about LF or VLF is another compliment to the entire American communications industry. However, my comments would be far from complete if I failed to tell you that IF and VLF radio continues to play a very important part in the Navy's world-wide communication necessities.

As many of you know, for this reason the Navy Department is now constructing what amounts to the "daddy of them all."

(Continued on Page 10)

Naval Communications Using Very Low Frequency

(Continued from Page 9)

Before World War II the Navy Department had plans for construction of a modern VLF station in the San Francisco area to augment the Navy's fleet broadcasts in the Pacific. After extensive surveys to determine the most suitable site, a site at Hetch-Hetchy, California, was chosen. This site appeared to be almost ideal for a catenary-type antenna system. Test data taken indicated a coverage that would fill in most of the gaps in the area under consideration that existed at that time. Negotiations to acquire a modern 500 kw VLF transmitter were about to be concluded when the national emergency that preceded World War II made it necessary to curtail this project in favor of acquiring a number of high-power high-frequency transmitters that could be more expeditiously obtained for emergency expansion in the Pacific and in the Panama Canal Zone. Accordingly, the Hetch-Hetchy project was abandoned and minimum essential VLF facilities in the San Francisco area were obtained by leasing an RCA owned 200 kw Alexander alternator at Bolinas for the duration.

Changes in operational needs and a continuing need for more adequate VLF facilities following World War II again focused the Navy's attention on the west coast as a possible site for such a facility.

Favor Seattle Area

Extensive search of all the area north of San Francisco led to the Seattle, Washington, and Alaskan areas where natural geography most favored such a station. At this point the choice of sites being considered was reduced to the Seattle area for logistic and technical reasons. It soon followed that a tentative site situated in Jim Creek Valley between the Wheeler and Blue mountains approximately eleven miles from Arlington, Washington, would be the logical site. Thus it was that the Navy was to have another "Radio Arlington" and although separated from the original "Radio Arlington" by thousands of miles and a half century of time, this Navy "Radio Arlington" was also to be the world's highest-powered VLF radio transmitting station. Yes, a modern 1000 kw VLF

station, capable of really world-wide coverage.

The transmitter, now about 98 per cent complete, is being manufactured by RCA at Camden, New Jersey. It is designed for use as a 1000 kw transmitter or as a 500 kw unit with a complete spare 500 kw unit for alternate use when operated at the lower power level. The normal operating frequency will be about 15 kilocycles. However, the equipment will be capable of operating on any frequency in the 15 to 35 kilocycle range.

The antenna system will consist of ten catenaries spanning the valley and varying from 5,640 to 8,700 feet in length, with actual radiators approximately 5,000 feet in length. The "T" type radiators will have vertical cables, averaging 1,200 feet in length, suspended from the mid-points of each span. These downleads will be connected to two central bus feeders, counter-weight structures will be provided to insure that they remain as nearly as possible in a vertical position. Each bus will consist of a specially designed conductor, 26 inches in diameter, supported on 14 towers about 140 feet in height, and extending approximately 2,500 feet from the transmitter building which will be located under the center of the antenna.

In order to obtain still greater efficiency, it was concluded that the antennae catenaries should be supported on a series of towers 200 feet in height located on the top of Wheeler and Blue Mountains. These towers are being designed to withstand the heavy loads resulting from winds and the accumulation of ice on the antennae. Provision will be made for lowering individual spans with portable winches and, in order that such an operation can be controlled properly, a system of communications to each tower site will be provided.

The transmitter building is the heart of the Jim Creek station, for it will house the bulk of the equipment necessary to activate the antennae system. The general arrangement and perspective of the building is functional. All unnecessary features have been eliminated. The building will be a reinforced concrete structure having welded structural steel trusses, wherever long spans are required. Two large areas have been provided in the rear of the building for the helixes and variometers to tune the an-

tennae. Because of the power involved, these structures require a space approximately 75 feet square by 60 feet high, and are completely shielded with copper.

The terrain at the transmitter building site is such that a very limited area is available for building construction, and to secure the required space it was necessary to divert the course of Jim Creek. Particular attention was paid to the possibility of slides which might result from deep cuts into the mountain side. These formations, of glacial origin, consist of shale and argillite and in places show advanced disintegration. The building will be supported on reinforced concrete foundations with earthquake struts, resting on spread footings.

Unusual Building

Because of the unique equipment to be located in the transmitter building, a number of unusual features have been incorporated into its design. For example, all of the reinforcing steel will be spot-welded together at every intersection, and in turn, grounded to a copper mat at not more than 5-foot intervals around the perimeter of the building. The ground mat underneath the entire building will extend approximately 30 feet beyond the outer walls of the structure. As mentioned previously, certain spaces must be shielded with copper, and because of the high intensity of the radio field, particular care must be taken to avoid sharp turns which would increase the possibility of corona discharges.

The magnitude of the radio frequency field generated by the antennae alone necessitates the installation of incombustible roofing material. It has been determined that conventional built-up roofing would constitute a hazard due to the heat generated by induced currents. Accordingly, all roof areas are covered with flat seam 20-ounce sheet copper which in turn will be connected to the ground mat. Other special features include the installation of extensive raceways to accommodate power, radio and telephone cables.

The building will be without windows. This design serves a dual purpose, first it reduces the chances that dust will get into the building, and it provides a certain amount of security from damage by

blast, without resorting to special blast-proof construction.

The antennae busses from the transmitter building come out the sides through 20-ft. square ports which are provided with copper-covered canopies to keep out snow and rain. This arrangement will be discarded when development of an electrical bushing is completed, which will permit running the busses vertically through the roof. Anticipating this in the design of the building, soft patches, approximately 15 feet in diameter, have been provided in the roof slabs in the center of each helix area.

Since much of the site is virgin territory, roads will be necessary for access to the transmitter building and to the tower locations on Wheeler and Blue Mountains. Presently there are a few logging trails which have been utilized by survey parties, but since improved means of access will be needed, construction of certain of these roads has already been undertaken. In addition, the station will require a number of supporting structures, including shops, storehouses and quarters for the operating personnel. These will be located approximately two miles from the transmitter building.

Power Supply

The station will require approximately 2,500 kilowatts of electric power and arrangements have been made with the Bonneville Power Administration for the construction of a transmission line from the Puget Sound Power and Light Company substation east of the town of Arlington, a distance of approximately twelve miles. In order to insure against interruptions resulting from failure of this source of supply an auxiliary diesel power plant will be located adjacent to the transmitter building for standby service. This plant will be equipped with diesel generators and will be so designed that it can be put on the line within two minutes after failure of the primary source of power.

A number of interesting problems have been encountered in connection with the design of this station. For example, it was found necessary to make careful studies of the effect that clearing large areas will have on the stability of the mountain slopes. Electronic considerations have dictated that an area 1,600

feet in diameter around the transmitter building be cleared of nearly all vegetation, and that an area extending 1,000 feet on all sides of the active antennae, amounting to approximately 1,450 acres, be cleared to a lesser degree. Furthermore, freeways, 25 feet wide, will be cleared under each antennae span in order that it can be lowered to the ground for inspection and maintenance.

Inasmuch as excessive erosion would be detrimental in that it could reduce the conductivity of the ground as well as tend to dam Jim Creek, thus increasing the chances of floods, steps must be taken to stabilize the slopes. Also, since these areas must be maintained clear of objectionable growth over the years, the cost of future clearing operations is being taken into account in the soil stabilization program.

One of the electronic requirements for a station of this sort is that a ground system be installed in the area under the antennae. For ideal operations a considerable portion of the valley should be copper-plated. Obviously, this cannot be done. However, a reasonably accurate facsimile will be provided.

Attached to the copper mat underneath the building mat will be radial copper wires spaced at angular intervals of 1 degree 20 inches and extending 2,500 feet from the transmitter building. Inasmuch as a goodly portion of the area consists of rock outcroppings, special means of attaching the ground wires to the rock are being devised to prevent their becoming displaced by debris. These wires will further complicate the problem of soil stabilization, and in

areas where top soil is available they will be buried at least one foot below the surface.

Another problem which has required careful study is the power supply for the station. As indicated previously, the total load is estimated to be approximately 2,500 kilowatts. Of this, 1,800 kilowatts represents the power required by the transmitter plate circuits. This is the load which is flashed on and off the transmitter as it is keyed. The design of the tubes is such that voltage variations in excess of five per cent may cause failure and it is necessary that the power supply system be designed for very close regulation. This problem is particularly aggravating insofar as the auxiliary power plant is concerned, and it has been determined that separate generators should be used for the tube filaments and plates. A 600 kw generator will be used for the filaments and three 1,000 kw generators will be required for the plates. The generators supplying the keyed load must be of special design to provide the required voltage regulation.

Field work including topographic surveys, clearing, road construction, stream diversion, and construction of the primary power line is now under way. Plans for the transmitter building have been completed and contract for its construction has been awarded. The rest of the facilities are in the planning stage and construction will be undertaken in the near future.

And now, to paraphrase Beethoven, "Barriers are not yet erected which to the American genius can say—thus far and no further."

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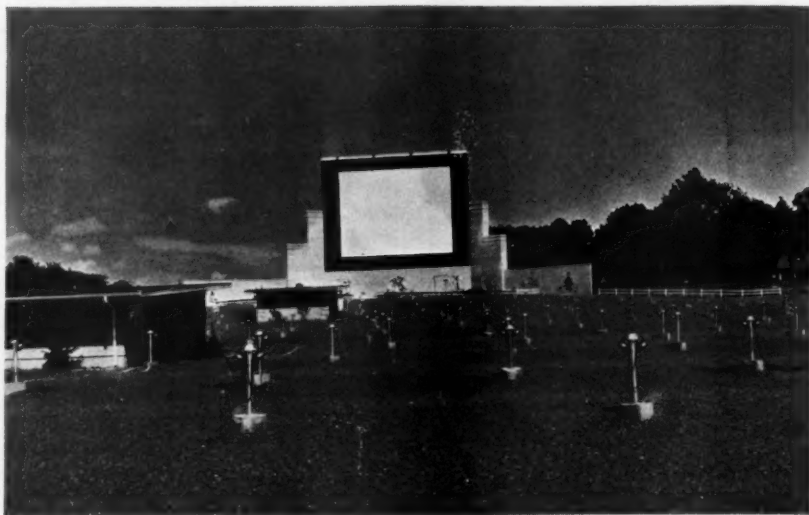
R. T. Van Niman

Chief Sound Engineer
Motiograph, Inc.

Leonardo da Vinci, who had a truly photographic mind, made single-color pictures by hand, a most difficult process with the added disadvantage that it did not allow duplicates. He could represent action only by painting his selection of the best instant of the subject portrayed. Though we know that the camera and glass-lens objective preceded the use of photosensitive materials, it was Louis Daguerre who deliberately sought and produced a photosensitive surface. His efforts, which unleashed the torrent of modern activities in the field of photography, were publicly recognized by the French government which purchased his rights for public use without royalty.

From then until now great strides in photography have been made, and sound recording has been added to moving pictures for increased realism in the pictorial rendition of action. In this paper we shall review some of the more recent advances, and attempt to evaluate them in terms of other entertainment and instructional mediums.

Today it is possible to purchase for as little as \$150, a television receiver which will give endless hours of programs of a picture quality approximately equivalent to an 8 mm motion picture, or the average home movie. A good quality 16 mm sound projector costs \$300 (the *Apollo* projector sells for \$129, using an auxiliary AM radio for the sound channel) and requires a source of films, whether rented at \$17 for a full length feature, or borrowed from a public relations department. It is not difficult to



Typical drive-in theater, showing concession stand at left, center screen, and individual car stands containing speakers.

see that in some ways the 8 and 16 mm film field is in a position with regard to television similar to the phonograph with regard to radio. In this train of thought, several patents have been issued recently for combination television and film-viewing systems for home use.

By various refinements in the engineering of 16 mm apparatus and film stocks, it is now possible to resolve as much detail and reproduce sound as well as the early 35 mm sound films. As a consequence, 16 mm film is used for both the amateur and the most advanced professional work. As yet, no one has found a way to pass sufficient light through a 16 mm film so that it can be used in the largest indoor and outdoor theaters. When this problem is solved, it is possible that 35 mm film uses, as we know them, will be outmoded.

Cinematography

During the war, the German army made extensive use of the 35 mm "Arriflex" vamera for news and battle-record photography. This camera is similar to the American "Cineflex" in that both use a rotating shutter at 45° to the lens

axis. The shutter has a mirror on its face which throws the image into a viewfinder during the film advance period. This is particularly valuable as it eliminates parallax errors from the viewfinder. Like the single lens reflex camera of still photography this follow-focus type of camera enables observation of depth of focus at all times, as well as exposures and all other matters of the scene being taken. However, as a single lens reflex, the "Arriflex" is a problem in bright sunlight as the image is often not as bright as desired. French Pathe has just introduced a 16 mm single lens reflex of similar value. Other features of the camera are similar to other semi-professional 16 mm cameras. The announcement by Bell and Howell of a reduced scale professional camera, identical with their 35 mm camera, is evidence of the marked increase of 16 mm production of professional quality.

Bell and Howell has announced a new series of coated lenses developed in cooperation with Taylor-Hobson, England. These lenses are supplied with click stops to identify settings under poor lighting conditions. The lenses are cali-

brated in both T-stops to signify transmission values and in geometrical-stops ("f"-numbers) for depth of focus computations. Of particular importance is the improvement of corner resolution in the new series.

Western Electric and Wollensak have announced a new series of lenses and finder improvements for the "Fastax" high-speed camera. These improvements will produce higher resolution and easier use of the finder. While the "Fastax" cameras record 5000 pictures per second on 16 mm film, or 10,000 maximum on 8 mm film, they are able to do this only for the last 50 feet of a 100-foot roll. Several accelerating systems have been used recently to permit longer full-speed takes.

The control of photographic processing operations is performed by the interpretation of successively graded exposures in terms of the densities or blackness produced on the film. The Photo Research Corporation and W. M. Welch Manufacturing Company have announced photoelectric densitometers of interest. The former is intended for color use by means of three filters. The Welch Densichron is notable for its accuracy and stability as a result of a-c field modulation of the phototube.

In the field of 16 mm projection, the Bell and Howell 16 mm arc projector has a reflector of rhodium, resulting in 1300 lumens output. The announcement of a solid pedestal base for this machine is evidence of the increasingly professional use of such equipment.

Compactness Achieved

The incorporation of a removable six-inch speaker into the side of the projector cabinet has permitted a weight reduction to 25½ lbs. for the Bell and Howell single-case 185 projector.

The 8 mm field has produced no new cameras or projectors of note in recent months. Likewise noteworthy is the lack of published material in the same field.

The requirements of a motion picture film have become more and more specialized. For example, a film stock for camera use is rarely used for projection. Projection films are often not only different in tonal reproduction character but also in the composition of the plastic base. Recently Du Pont has introduced a color release stock that substi-

tutes polyvinyl alcohol for the more common gelatin. Eastman Kodak has announced work on a safety, or non-inflammable, film base which matches the projection qualities of the well-known, but dangerous, cellulose nitrate base.

Projection and Sound

The two most outstanding advances in the field of motion picture sound reproduction are the advent of magnetic recording and the use of new phototubes in optical sound-reproducing equipment.

A peculiarity of the common phototube is the noise it produces when light falls upon it, causing a certain amount of noise. Among the methods of reducing this noise are the various schemes for blocking the sound track in the absence of modulation. A new approach is the use of lead sulphide photoconductive tubes which have much less light noise, and considerably improved sound projector performance. Research is being continued, particularly in the use of the phototube with some types of color film.

Development of a contact printing process for magnetic recording has been announced by Marvin Camras of Armour Research Foundation and Minnesota Mining and Manufacturing Company. The method permits faithful duplication at high speed and in large quantities from pre-equalized master tape. The master is held in contact with a blank tape while the two are passed through a "transfer field." Upon separation of the copy tape from the master, the copy retains an accurate reproduction. The method is applicable to discs also.

The tape printer, which can reproduce eight tapes from a single master, will produce more than 960 hours of recording per day. Of particular interest is the economy of the magnetic printing process, as the master does not deteriorate during use. No further processing of the copies is required. The speed or "exposure" during printing is not critical.

The drive-in theater, in general, was not taken seriously until individual speakers were provided within each car. A heater has recently been proposed to go with the speaker, and this may extend the useful season. The engineering requirements of a 35 mm projector for drive-in use are quite severe. The majority of the present installations are de-

signed to operate at the highest light output permissible without intolerable film or equipment damage.

Television

In the television realm, the rectangular 16-inch glass image-tube and the grey background image-tube are the most evident advances to reach the consumer. The hottest engineering question is the adoption of a standard color system for broadcast use, but other problems will be discussed here.

The greatest single problem facing television, in general, is the improvement in light output to enable the viewing of larger images at an adequate brightness level. If the scanning beam is the source of energy to be converted into light, the individual phosphor areas are activated for only a very short time. A logical solution of such a problem is the use of the scanning beam as a triggering probe to make each spot opaque or transparent until the beam returns. The maximum gain of this solution is obviously great.

A solution advanced by Federal Telephone and Radio Corporation involves a layer of magnetic particles which are normally opaque, but permit light to pass upon impingement of the scanning beam. Scophony and Skiatron Corporation have advanced similar solutions involving ultra-sonics and ionic or dichroic crystals. Raytheon has offered a similar solution using electrostatic stress in spherical particles. In order to obtain a longer path between the electron gun and the phosphor screen, the system may be folded by an electron mirror, thus enabling a larger image in a given cabinet depth.

Discussion and Conclusion

The pressure for solution of the color television standards battle has to a certain extent blanketed the discussions of frequency allocations and practices for 1000-line and theatrical television. If it becomes possible to operate 1000-line television systems in the nation's theaters, it is entirely possible that films will no longer be projected locally. In their place the theater screen may show the televised image of the master film at the central transmitter.

Engineering in 35 mm equipment has been concentrated upon the attainment

(Continued on Page 24)

Attention, WSE Members!

Your Educational Committee Needs This Information

Members are asked to fill in the questionnaire below, so that the WSE educational committee may have an indication of your desire for certain courses.

John F. Parmer, educational committee chairman, earnestly requests you to study the list carefully and check those subjects (1) which you would be interested in studying, (2) which you feel would have benefited you had they been included in your engineering curriculum, and (3) add to the list subjects which you feel should be included in the broad educational program.

The refresher courses which have been given during the past year, have been enthusiastically received. The more general part of the educational program sponsored by the

cooperating societies got under way in February with classes currently being held in philosophy and public speaking.

The report of the first General Educational Committee recommended that a "broad non-technical program of instruction in human relations and business principles" be offered to the members of the engineering profession. To meet an immediate need refresher courses for professional engineers were to be given. "The broad aim of the program is to help the engineer become a better technician, to fit himself for administrative duties, and to become a better entity in the social organization of the country," Parmer said.

In a recent magazine article, Walter Evans, vice president, Westinghouse Electric Corporation, himself an engineer, said in speaking of executives, "Five special attributes appear to mark these successful individuals; an ability to express themselves clearly and well; normal curiosity regarding economics, finance, law, psychology and other non-engineering subjects; a willingness to make the logical and reasonable compromise with perfection which day-to-day business requires; a ready understanding that income must exceed outlay; and, above all, an ability to get along with their contemporaries and at least to understand their competitors."

Please check as requested above. Cut off and mail to: -----

Questionnaire

Western Society of Engineers
84 E. Randolph Street
Chicago, Illinois

	Should be given by WSE in fall	Will take course, if given by WSE	Should be given to engineers while in college
Development of the American Labor Movement			
Elements of Collective Bargaining			
Human Relations			
The Development of Political Institutions			
Report Writing			
Reading, Writing, and Thinking			
Public Speaking			
Economics of Price			
Money, Credit, and Debt			
Systems of Political Economy			
Literature, Background or Survey Course			
Philosophy			
Banking Practices			
Credit Analysis			
Accounting Principles			
Financial Statements			
Basic Law			
Law of Contracts			
Letter Writing			
Salesmanship, including Self-Selling			
Business Organization and Administration			
Refresher Courses in Specific Subjects			
SUGGEST ADDITIONAL SUBJECTS HERE			



VIEWS OF THE

Washington Award Dinner

Five-hundred forty-eight guests were present at the Washington Award Dinner, February 27, 1950, to see the Washington Award for 1950 conferred upon Wilfred Sykes, chairman of the executive committee of Inland Steel Company.

After his opening remarks, Dr. L. E. Grinter, chairman of the commission, introduced the members of the commission, as follows: Leroy F. Bernhard, Charles B. Burdick, John F. Calvert, Howard A. Herder, Louis R. Howson, Eldon A. Imhoff, Hjalmar W. Johnson, Alf Kolflat, William A. Lewis, Titus G. LeClair, Verne O. McClurg, Thomas S. McEwan, J. T. Rettaliata, George S. Salter, Frank V. Smith, Fred T. Whiting.

Dr. Gustav Egloff, president of WSE, in presenting the token of the award, made the following statement:

"Wilfred Sykes is a most modest man despite his notable achievements as an engineer, administrator and civic benefactor. In his early career as an electrical engineer, he designed huge electrical hoists for the gold mines of South Africa. He was a pioneer in the development of electrical equipment in the steel industry and is the inventor of many improvements in the steel-making process. Under his leadership, Inland Steel has tripled its capacity.



Above,
Wilfred Sykes,
recipient of the
Washington Award
for 1950.

Left,
Washington Award
principals are shown
at the dinner, from
left to right, Dr.
Gustav Egloff, WSE
president; Dr. L. E.
Grinter, Commission
chairman, and
Wilfred Sykes,
1950 recipient.

"In spite of his heavy administrative duties at Inland Steel, he has found time to contribute outstanding service to educational institutions. He is a Trustee of the Illinois Institute of Technology and has been particularly active in its new building program. For many years he has been a leader in the Glenwood Manual Training School which provides a home and proper training for underprivileged boys.

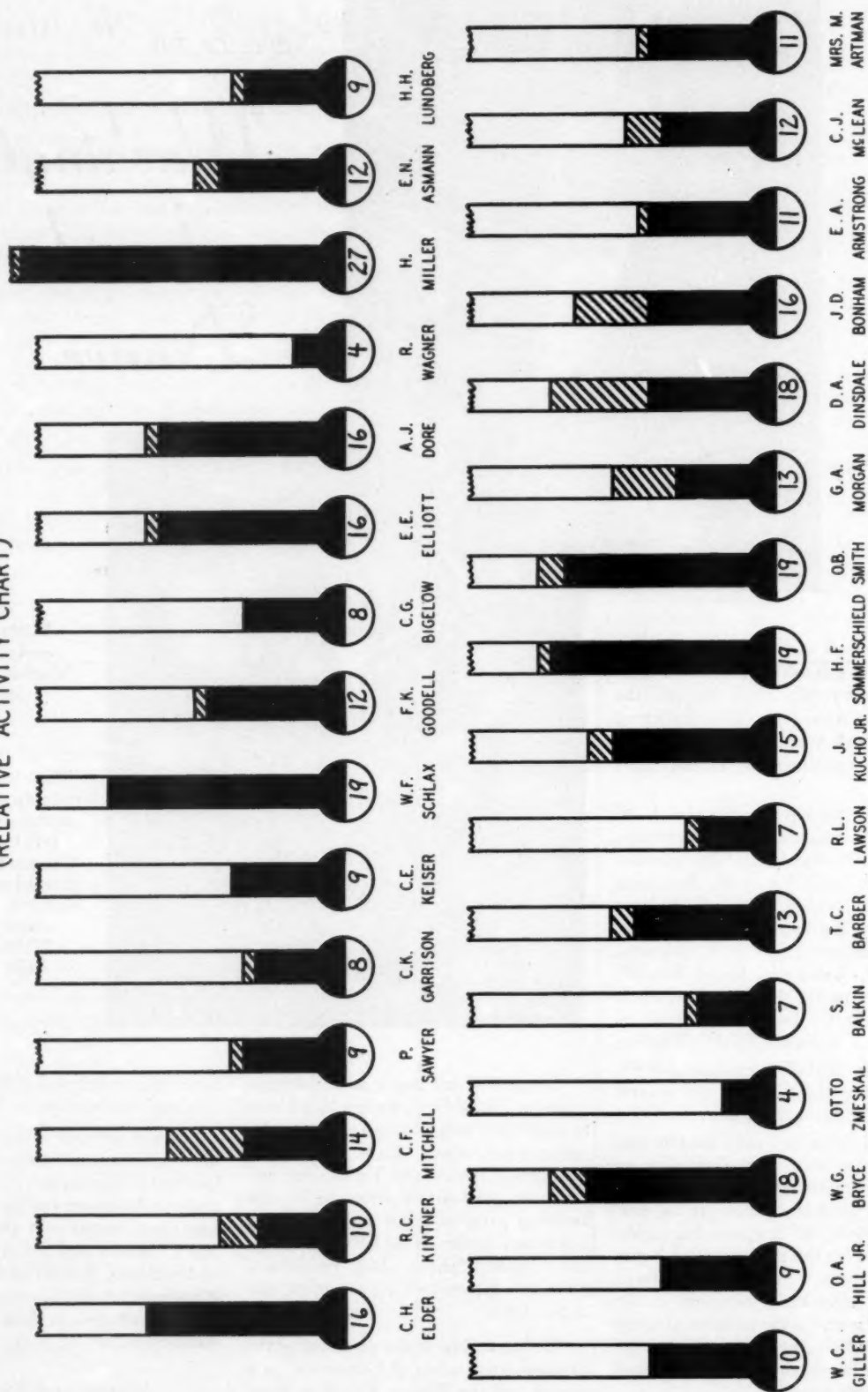
"He has served as the president of the Chicago Association of Commerce, as a member of the Illinois Post-War Plan-

ning Commission and as a director of the National Association of Manufacturers.

"He is a member of a number of technical societies including the American Institute of Mining and Metallurgical Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers and the Western Society of Engineers. In two of these societies, it has been my good fortune to work with him and observe at first hand the outstanding ability of Wilfred Sykes.

(Continued on Page 20)

WESTERN SOCIETY OF ENGINEERS MEMBERSHIP DRIVE (RELATIVE ACTIVITY CHART)



ADDED THIS MONTH
 TOTAL TO LAST MONTH

To All Members of WSE:

Have you realized that we are well into the last quarter of our fiscal year, and that many of you have not yet secured your *one* "new member?"

Do you know that Dr. Egloff, your president, has secured 14 new members? That Otto K. Jelinek, Transportation section chairman, has secured 12 new members? That Herbert Sedwick, your First Vice-President has secured 11 new members?

Two men have secured ten new members: Herbert R. Miller and Francis J. Maney. O. A. Walsh has obtained seven new members, and A. G. Allen and Percy Sawyer have obtained six members each. E. E. Elliott has five new members to his credit. Four men have obtained four new members each: A. P. Boysen, Joseph Kucho, H. H. Lundberg, and J. T. Rettaliata.

Have you been helping your team and group leader? Their record to date is shown on the opposite page. If you wish to see who leads your group, call the WSE office, Randolph 6-1736.

We have approximately 200 to go in 2½ months. Get behind your group leader and your society, and secure your *one* "new member."

These members have secured their new member:

Allen, A. G.
Anderson, Arthur
Anderson, Bolton G.
Anderson, R. E.
Andrews, F. E.
Armstrong, E. A.
Artman, Mrs. M. E.

Baier, P. J. Jr.
Bailey, G. G.
Baker, Albert
Balkin, S. F.
Barlow, J. T.
Barmack, B. J.*
Beattie, C. S.
Becker, D. N.
Benoit, Wm.
Bernhard, L. F.
Blanchard, G. L.
Bonham, J. D.
Boysen, A. P.*
Bradley, B.
Brewer, A. H.
Burt, George H.
Buxton, B. L.

Carlson, A. C.
Carlson, Wm. C.*
Carlson, W. W.
Carnahan, L. B.
Caskey, A. D.
Coxe, H. A.
Crossman, G. I.
Culp, E. R.

Dartsch, F. A. L.
Davies, F. C.
DeLeuw, C. E.
DeWolfe, E. C.
Dinsdale, David A.
Doyle, T. M.

Edwards, F. W.
Egloff, Gustav
Elder, C. H.
Elliott, E. E.
Ellis, H. W.
Epstein, A.

Eshbach, O. W.
Euler, F. C.

Fischer, D. J.
Fitzpatrick, P. J.
Fletcher, E. N.
Flood, Paul
Fox, E. Gordon
Frederick, T. C.

Gabbard, L. C.
Garrison, C. K.
Gates, L. Dean
Gibson, F. D.
Gleick, J. T.
Gnaedinger, J.
Goodell, F. K.
Gordon, B. A.
Gordon, J. J.
Gould, G. Fred'k
Graham, I. E.
Gray, Walter
Griesel, Margaret
Gutgsell, L. M.
Guthrie, R. M.

Hagedorn, H. P.
Hall, George S.
Halperin, Herman
Halvorsen, H. L.
Halvorsen, Ralph
Hanson, C. D.
Hanson, R. M.
Harrington, J. Earl
Haynes, C. J.
Hecht, J. L.
Hendrickson, E. R.
Herr, C. C.
Holt, N. C.
Horneman, Miss B.
Howson, A. W.
Huff, Julius
Humiston, J. F.

Imhoff, E. A.

Jackson, A. L.

Jelinek, O. K.
Johnson, Elmer A.

Kahler, W. V.
Kawiecki, C. J.
Keith, A. W.
Kelly, R. R.
Kerr, A.
Kintner, R. C.
Klammer, K. K.
Kocsis, P. Jr.
Kraft, John E.
Kreller, R. A.
Kucho, Joseph

Lagerstrom, Harry
Langdon, L. E.
Larson, M. N.
Lauritsen, C. N.
Lawson, R. L.
LeBaron, T.
LeClair, Titus G.
Lockwood, L. E.
Long, G. F.
Lundberg, H. H.
Lundstrum, J. E.
Lungren, E. E.
Lusher, M. H.

McCallum, V. E.
McClurg, V. O.
McKee, K. E.
McLean, C. J.
McMinds, P. J.
Mamett, F.*
Maney, F.
Marsh, Edward J.
Marston, W. R.
Mason, W. C.*
Mee, C. L.
Melnick, T.
Merrill, Mrs. D.*
Michaels, E. E.
Miller, Herbert R.
Mitchell, C. F.
Mittelmann, Eugene
Murphy, Miss M. L.

Neighbour, D. J.
Nielsen, E. R.
Norman, C. M.*

O'Connor, R. R.
Ooms, J. W.
Orloff, Melvin

Parker, R. I.
Penn, J. C.
Perkins, Miss R.
Perkowski, N.
Peterson, Jas. Edw.
Peterson, Ralph S.
Pillsbury, C. S.

Ramusack, J.
Randall, Edwin A.
Reske, E. F.
Rettaliata, J.
Ritchie, James F.
Rivenes, A.
Rogers, D. E.
Rogers, Edgar*
Ruzich, J. L.

St. Germain, A.
Salzman, A. L.
Sargent, Ralph
Saunders, N. H.
Sawyer, Percy
Scaar, Harry
Schick, N.
Schirmer, R. W.
Schlesinger, L.
Schmitz, C. E.
Schoonover, H.
Schutte, L. H.
Schweitzer, W. E.
Scopelitte, J.
Sedwick, H. P.
Seymour, C. W.
Serat, G. W.*
Showtis, B. M.
Sikes, A. W.
Simpson, G. N.

Skog, Ludwig
Smedley, G. P.*
Smith, D. L.
Smith, F. C.
Smith, O. G.
Smith, Osborne B.
Sommerschild, H. F.
Sonderegger, H. H.*
Spencer, A. L.
Stanton, K. J.
Stoler, G. S.*
Strazz, A. J.
Stump, R. D.
Svelnis, F. V. Jr.*
Sykes, Wilfred

Taylor, O. H.
Thomas, Frank P.
Todman, H. G.*
Towle, J. H.*
Tornquist, F. L.
Trees, C. S.*
Tuttle, L. W.

Vanderkolk, W. W.
Vanderpool, A. M.*
Vivoda, J. V.

Wade, J. William
Walker, C. W.
Walsh, D. A.
Weeks, L. E.
Whitehead, E.
Whiting, F.
Wier, R. J.
Wilkins, D. C.
Williams, Kenneth
Williams, G. M.
Willet, G. R.
Wilson, J. R.
Wisner, G. F. Jr.
Witt, J. C.
Wolfe, Thomas
Woloshin, Boris

Zachary, J. L.*
Zermuehlen, H.

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Section, Division To Elect

Consulting Engineers' Division

The nominating committee of the Consulting Engineers' division has nominated the following two corporate members as the regular ticket for councilmen of the division, for a term of three years beginning June 1, 1950.

Harold G. Love, Partner, Niestadt & Love, 407 S. Dearborn St., Chicago
Frank A. Randall, Partner, Frank A. Randall & Sons, 205 W. Wacker Dr., Chicago

Other corporate members may be nominated by petition signed by ten corporate members of the Society, provided acceptance of these nominees has been secured in writing.

The councilmen will be elected at a luncheon meeting of the division, April 25, at WSE headquarters.

Hydraulic, Sanitary and Municipal

The nominating committee of the Hydraulic, Sanitary and Municipal Engineering section has nominated the following two corporate members as the regular ticket for directors of the section, for a term of three years beginning June 1, 1950:

C. R. Andrew (Retired), 6518 Kenwood Ave., Chicago
Thomas M. Niles, Partner, Greeley and Hansen, 220 S. State St., Chicago

Other corporate members may be nominated by petition signed by ten corporate members of the society, provided acceptance of these nominees has been secured in writing.

The directors will be elected at a meeting of the section, Monday, April 10.

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Batthey and Childs.....	24	Switchboard Company.....	18
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Dean Eshbach To Speak Before WSE Women's Division April 12

Dean Ovid Wallace Eshbach of Northwestern University's Technological Institute, will be guest speaker at a meeting of the Professional Women's Council of WSE, on Wednesday, April 12. Chairman Mary Murphy will call the meeting to order at 7 p.m. There will be a pre-meeting get-together dinner at 5:30 p.m.

Miss Georgiana Peeney, engineer, and an outstanding graduate of Northwestern, arranged the program for this meeting. The subject will be "Technical Education for Women."

Dean Eshbach is a graduate of Lehigh University, B.S. and M.S. in Electrical Engineering and honorary Dr. Science. He came to Northwestern as Dean of the Technological Institute in 1939, after serving as special Personnel Assistant with American Telephone and Telegraph from 1925-39. He is ably fitted to discuss personnel problems, since he dealt with the technical employment of young engineering graduates for the laboratories, taught at Brooklyn Polytechnic Institute, and supervised the graduate electrical engineers group from MIT who were working part-time at A.T.T. as part of their course. In addition, his work at Northwestern has been outstanding.

He was a 2nd Lt. Signal Corps and OCS instructor during World War I and held special government assignments during World War II. He is a member of Tau Beta Pi, Eta Kappa Nu, Pi Tau Sigma, AIEE and AAAS (fellow) and one of our own WSE members. Dean Eshbach's home is in Kenilworth, where he is active in church and civic affairs.



Dean Ovid W. Eshbach

All members are invited to attend this meeting and it will be especially interesting and informative to those in personnel work.

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Choose James D. Cunningham As CTSC Award Recipient

James D. Cunningham, president of Republic Flow Meters Co., will be awarded the Chicago Technical Societies Council 1950 merit award for "outstanding engineering, administrative, and civic service," it was announced today by Robert H. Bacon, president of the council.

Mr. Cunningham is president of the American Society of Mechanical Engineers and a member of WSE. He will speak on "Technical Know-How—Not Enough."

The 1950 award will be made at a dinner Tuesday, May 9 in the Furniture Club, 667 N. McClurg Court. The program will include an informal reception at 5:30 p.m., dinner at 7 p.m., to be followed by the presentation of the award and Mr. Cunningham's address. His award will be presented by Dr. Gustav Egloff, WSE president, who is a past president of the technical societies council, and chairman of the award committee.

Students at Northwestern and I.I.T. To Speak April 25-26 In Competition

The yearly prize paper competition for students of the Illinois Institute of Technology and The Technological Institute of Northwestern University will be held at 6:30 P.M. on Tuesday, April 25, at Illinois Institute and Wednesday, April 26, at Northwestern University.

Six prizes will be given at each school, three for Undergraduate student papers and three for graduate student papers. The undergraduate student member winning first prize at each school will be eligible to present his paper at the Great Lakes District meeting in Jackson, Michigan on May 11 and 12, 1950, where he will compete for the National Headquarters first prize.

The graduate students whose papers win first prize will also compete at this

Great Lakes District meeting for a district prize.

The prizes offered by the Chicago Section and winners certificates will be given to the students at the Joint Meeting of the Western Society of Engineers and the American Institute of Electrical Engineers on Thursday, April 27 at the Illinois Bell Telephone Company Bell Forum, 311 W. Washington Street.

These papers represent considerable effort on the part of the students and are presented in a very interesting manner with complete blackboard descriptions and in some cases actual equipment. It is well worth the time of any engineer to attend these prize paper contests, and it will give encouragement to the students who participate.

To All W S E Contest Entrants:

WSE members who plan to submit papers for the cash award contest, should omit their names from their entry, and include them in separate covering letters, it has been announced.

Any member who is writing a paper, but who may not have notified WSE headquarters of his intention to enter the contest, should do so immediately, by calling RAndolph 6-1736.

Papers will be judged on originality, editorial merit, value to engineering and timeliness of subject matter.

Papers must be submitted to the Awards Committee not later than May 1. A short synopsis of 100 to 300 words should be included.

The prizes will be presented at the Annual Spring Dinner to be held May 29, 1950.

All manuscripts, drawings, and exhibits become the property of the Western Society of Engineers, and cannot be returned. Rights for possible publication are reserved by Midwest Engineer.

If papers of sufficient merit should not be submitted, the Awards Committee reserves the right to award less than three prizes, or postpone the competition.

Washington Award

(Continued from Page 15)

"It is highly fitting that his name be added to the list of distinguished recipients of the Washington Award which began with Herbert Hoover in 1919 and includes such illustrious men as Orville Wright, Charles F. Kettering, Frank B. Jewett, Ralph Budd, Henry Ford, and Vannevar Bush.

"Wilfred Sykes, on behalf of the Western Society of Engineers, it is a pleasure to present you with this scroll which is inscribed:

WASHINGTON AWARD
For Notable Contributions
To The Public Welfare Through
Engineering and Science
Conferred in 1950 Upon
WILFRED SYKES
for Invention of Electrical
Machines and Steel Processes
For Advances in Industrial
Administration and Cooperation
For Counsel to State and College."

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Annual Midwest Power Conference Opens Wednesday, April 5 at Sherman Hotel

The annual Midwest Power Conference, in which WSE cooperates, will be held April 5 to 7 at the Sherman Hotel in Chicago.

Sponsored by Illinois Institute of Technology, the conference has the cooperation of nine midwestern universities and nine local and national societies.

All persons interested in power production, transmission or consumption are invited to attend the three days of technical sessions on all phases of the subject—technical, economic, social.

A joint luncheon with WSE will be held Friday, April 7, at 12:15 p.m. Chairman of the luncheon will be Gustav Egloff, WSE president; the speaker will be J. B. Thomas, president, Texas Electric Service Company, Fort Worth, Texas.

WSE members, wives, and friends are especially invited to the "All Engineers Dinner" to be held Thursday, April 6 at 6 p.m. in the Grand Ball Room of the Sherman Hotel. Toastmaster will be Robert E. Wilson, chairman of the board, Standard Oil Company (Indiana), and the speaker will be Philip D. Reed, chairman of the board, General Electric Company, and president, International Chamber of Commerce, New York.

Special sessions on Wednesday, April 5 will concern steam generating equipment, electrical equipment, feedwater treatment, fuels, and system planning and design.

On Thursday, April 6, the participants will discuss power system operation, feedwater treatment, rural electrification, central station plants, small power plants,

industrial applications of electrical energy, electronics applications, power plant design and construction, and miscellaneous steam applications.

The sessions scheduled for Friday, April 7, will concern atmospheric pollution, diesel engine maintenance, heat pumps, heating and air conditioning, gas turbine locomotives, feedwater treatment, and relay testing practices.

Reservations for the conference may be made with Edwin R. Whitehead, conference secretary, Illinois Institute of Technology, 3300 Federal Street, Chicago 16, Ill.

Cost of registration, including one copy of the *Proceedings*, is \$5.00, luncheon reservations are \$3.00, and the All Engineers Dinner will be \$4.50.

Among the WSE members taking part are W. A. Lewis, H. E. Nason, H. J. McCreary, Gustav Egloff, J. T. Rettaliata, Andrew R. LeBailly, and E. L. Michelson.

Clarence B. Pederson (WSE) was cited in a recent issue of *Construction News*, for his part in the design and installation of electrical work in many of the telephone buildings in the Chicago area.

Describing his career in the column, *Who's Who in Construction*, the paper stated, "His work since he joined the company in 1921 has included the conversion from D.C. to A.C., the design of service and distribution systems, lighting projects, and the preparation of operating and maintenance practices."

CRERAR LIBRARY Notes and News

The re-organization of the scientific and engineering periodicals in the Technology Department was reported in an earlier issue of *Midwest Engineer*. Supplementing this improvement in the accessibility of periodicals to readers, the Department has brought the indexing and abstracting journals together in the corner of the 14th floor to the right of the elevators as one enters the Department. Located here are *Engineering Index* (the set of annual volumes and the current card file), *Industrial Arts Index*, *Chemical Abstracts*, and abstracting journals covering special subjects. Among the latter, the Library has recently added *Fuel Abstracts*.

* * *

A feature of our biweekly list of new publications for the Technology Department, *These are New*, will be the listing of new scientific and technical periodicals added to our subscriptions. Recent titles include *Applied Hydraulics*, Volume 1, 1948, and the *Communications of the Gas Research Board*. There is also a group of technical periodicals published in Stockholm which were established in 1948, *Archives of Chemistry*, *Archives of Geophysics*, *Archives of Mathematics*, *Archives of Physics* and *Archives of Mineralogy*.

Three important new German periodicals have also been added to the Library. *Frequenz; Zeitschrift für Schwingungs- und Schwachstromtechnik* (Frequency; Journal of technical applications of oscillation phenomena and weak currents) Volume 1, 1947; *Heidelberger Beiträge zur Mineralogie und Petrographie* (Heidelberg Contributions to mineralogy and petrography) Volume 1, 1947; and *Zeitschrift für Angewandte Physik* (Journal of applied physics) Volume 1, 1948.

* * *

Members of WSE are invited to suggest new periodical publications that come to their attention, which would be useful additions to the Crerar subscription list.

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Gen. Eisenhower Speaks at Presentation Of Moles Award to Hoover, Dougherty

General of the Armies Dwight D. Eisenhower was the guest speaker as former President Herbert Hoover and Richard E. Dougherty, retired vice-president of the New York Central System, received the 1950 Moles Awards for public service and contributions to construction at the society's Tenth Annual Award Dinner held February 9 at the Waldorf-Astoria Hotel, New York.

Bronze plaques and parchment citations were presented to Mr. Hoover and Mr. Dougherty after General Eisenhower, president of Columbia University, was made an honorary member of the Moles, the association of leaders in America's heavy construction industry.

Mr. Hoover, who received the traditional non-member award made by the society, was honored for his long career of public service, particularly for his achievements as head of the Hoover Commission, the example he has set in inspiring the ideals of individual enterprise and personal freedom and for his accomplishments in the engineering profession.

Mr. Dougherty received the annual award made by The Moles to one of their members in recognition of his forty-six years with the New York Central, of which he was the principal engineering officer before retirement; for his leadership in his profession, as president of the Engineers Joint Council and past President of the American Society of Civil Engineers, and for his achievements in railway and real estate development.

In accepting the award from Carlton S. Proctor, president of The Moles, Mr. Hoover chided politicians for pyramiding waste and failing to adopt efficient methods of administration developed by private enterprise.

He pointed out that the disregard for economy has been obscured by the creation of "national demons," privately-owned industries which are made public scapegoats for all the nation's woes.

"Once kerosene was a national demon," Mr. Hoover continued. "No one could win an election unless he re-

proached the villainies that were in it. . . . At another time the canals were the national demons—supposedly sucking the blood from the toil of millions. . . . Then for thirty or forty years the railways served as the most lively of the national demons. . . . And the statesmen worked for years to put them under. . . ."

In his presentation to Mr. Hoover, Mr. Proctor said, "Unquestionably the outstanding contribution to our industry, and for that matter to all of American free enterprise, has been the reports of the Hoover Commission. . . . It was in a spirit of enthusiastic agreement as to the construction industry's debt of gratitude to Mr. Hoover that the proposal was made that this year's non-member award should go to him."

The honorary membership in The Moles was conferred on General Eisenhower by Mr. Proctor, who said it was done "As evidence of our desire to share in the homage and gratitude of this and future generations to the man who, as the greatest war leader of all times, brought victory to us and our allies."

William Durkin, President of Walsh Construction Company, builders of scores of notable construction projects, presented the member award to Mr. Dougherty and said that "he has reached the top in construction, engineering and civic activities." He reviewed Mr. Dougherty's railway career and noted that he had been the New York Central's principal engineering officer for eighteen years before retirement in 1948; vice-president of 42 subsidiaries; a director of 28 and an executive of professional societies.

Responding to Mr. Durkin, for many years his close friend and fellow member of The Moles, Mr. Dougherty said, "Tonight seems like a wonderful dream . . . the thrill of it is greatly accentuated by the corresponding non-member award to one of the greatest engineers and public officials of all time." He recalled some of his experiences as an engineer and said his most difficult job was on the four-tracking of the New York Central's Hudson division between Garrison and Tarrytown, N. Y.

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Beach Erosion Control Projects On North Shore Recommended

Recommendations for beach erosion control projects along the Illinois shore of Lake Michigan have been made by the District and Division Engineers, as the result of a cooperative study by the State of Illinois and the U. S. Government.

The report favors the participation by the Federal government in the cost of providing protection and stabilization to the publicly-owned shores and beaches and providing additional beaches for recreational purposes at localities where the remedial measures are economically justified and where local interests have indicated that they will be able to provide the necessary operation.

Now Being Reviewed

The recommendations are currently being reviewed by the Beach Erosion Board in Washington, D. C., which has given preliminary consideration to the report, agreeing with most of the proposed projects, with the exception of five Chicago beaches whose purpose would be primarily recreational with only incidental protection purposes.

The specific recommendations include:

- (a) Construction by the Federal Government of improvements at the Great Lakes Naval Training Center and at Fort Sheridan, including protection of the shore and improvement of the beach.
- (b) Adoption by local governing agencies of plans for improvements for the sections of non-Federal publicly-owned property specified in the report, with such modifications as in the opinion of the Chief of Engineers may be desirable at the time of construction.
- (c) Participation by the Federal government to the extent of 1/3 of the original cost of the specified improvements, with one exception.

The engineers have recommended, and the Beach Control Board has signified tentatively its general agreement, with projects at Lake Park in Lake Bluff, Forest Park in Lake Forest, Elder Lane Park in Winnetka, Waterworks Park and Mahoney Park in Kenilworth, and projects in Evanston at the Clark, Dempster, and Lee St. beaches, plus riprap

along the public-owned shore in Evanston.

The engineers have recommended projects at five Chicago sites, between North Ave. and Oak St., between Grace St. and Belmont Harbor, between 27th and 49th Sts., between 51st and 55th Sts., and between 71st and 75th sts., but the Beach Control Board does not consider them eligible for Federal funds because of their primarily recreational character.

Recent Developments in Motion Picture Engineering

(Continued from Page 13)

of economy in photoplay production, and the development of drive-in projection and sound equipment. The use of 16 mm film for television transcription and small theaters, particularly abroad, has resulted in more engineering advancement than was anticipated.

The use of 16 mm for home entertainment is so expensive that few can afford it. The advent of 8 mm magnetic sound on films may well remove the remainder of the non-professional market for 16 mm films. The use of 8 mm and 16 mm motion pictures is still beyond the reach of many who can afford television.

After a survey of the field, one may well ask what is going to happen to binocular and binaural systems. No mention of either has appeared in the last year, although significant advances have been reported indirectly from Europe. If any reasonable resolution is achieved in color TV, it is very logical to assume that conversion of 35 mm theaters to depth pictures with three dimensional sound would eliminate the threat of such competition. There are many other current developments which will assure that motion pictures and television will retain their present popularity.

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ANALYSES REPORTS APPRAISALS

ASME Holds Spring Meeting April 12-14

The American Society of Mechanical Engineers will hold its spring meeting in Washington, D. C., April 12-14. Forty-five papers will be presented during 21 technical sessions sponsored by 19 professional divisions and committees of the society, and the American Rocket Society, ASME affiliate, which will sponsor one of the sessions and participate in another. Headquarters will be the Hotel Statler.

A total of 66 speakers will deliver papers in such fields as aviation, power, fuels, industrial instruments and regulators, management, heat transfer, machine design, education, applied mechanics, metals engineering, gas turbine power, oil and gas power, cutting fluids, metal cutting, rocketry, process industries, wood industries, safety and lubrication.

A feature of the program will be a symposium on turbo-jet gas turbine anti-icing, sponsored by the aviation division of the society on Thursday, April 13. Advance security clearance will be required of each individual attending this symposium.

With the Federal Government a heavy investor in scientific and industrial research and the great number of scientific laboratories situated in the Washington vicinity, full advantage will be taken of the opportunity to visit these research institutions. Inspection trips have been arranged to the Naval Ordnance Laboratory, Potomac River Generating Station, David Taylor Model Basin, Bureau of Standards, Timber Engineering Laboratory, U. S. Naval Academy and the U. S. Naval Engineering Experimental Station.

The Robert Henry Thurston Lecture, founded in honor of the first president of the society, will be delivered by Dr. Theodore Von Karman, director of the Guggenheim Aeronautical Laboratory, California Institute of Technology, and Giuseppe Gabrielli, chief engineer, Fiat Aircraft Works, Turin, Italy, on April 12. Their subject will be, "Specific Power Required For Propulsion of Vehicles (What Price Speed?)."

Age Determines Worries

Age levels rather than economic conditions determine the degree of personal economic worry, according to a survey on lifetime worry patterns conducted by Dr. Willard A. Kerr, associate professor of psychology at Illinois Institute of Technology, and two students.

The findings, based upon questionnaires completed by 103 older members of the American Psychological Association, were reported by one of the students, Harry L. Newman, at the annual Midwest Conference of American Psychologists in the Drake hotel.

"Each psychologist," Newman said, "was requested to state the age or age level at which any or each of the potential fields of worry had proved a serious problem to him."

Results showed that between the ages of 29 and 34 economic worry was the most predominant, most frequently recurring, and persisted regardless of the current business cycle.

"Psychologists now between ages of 45 and 49 reported they were most affected by economic worries at the age of 30, or during the depression year of 1932," Newman said.

"Psychologists now between ages 50 and 54 also reported a peak economic worry load at the age of 30, which was

the relatively prosperous year of 1927."

Job security and lack of confidence in business success also ranked highest at the age of 30, he stated.

"A chronological sequence of the remaining major worries," according to Newman, "begins with worry about personal appearance, maximizing at age 20 and overlapping markedly with worries of morality most obvious at 23.

At the age of 26, the psychologists lacked confidence in making a good impression on people. At 30, economic worries predominated, and at 31 they lacked confidence in personal business success.

"Other worries," he reported, "prevail at the following ages: job security, age 33; health, age 38; political convictions, age 41; marital difficulties, age 42; giving up ambitions, age 45. Thereafter" he said, "the major worry concerns health."

"Between the ages of 18 and 25, these psychologists concentrated on idealism and personal development. Later emphasis shifted to problems of survival and hard reality, and finally to political conditions and health, indicating a practical combination of earlier idealism and subsequent experience with reality," Newman said.

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Public Service Company Installs Turbo-generator at Joliet Plant

A new 107,000 kilowatt turbo-generator has been put in service by Public Service Company of Northern Illinois at its power plant on the Illinois waterway just south of Joliet, it was announced by Britton I. Budd, president of the utility.

The new steam-electric generating unit, one of the largest ever installed by the company, produces enough electricity to serve a city of nearly 225,000 population.

Installation of the new unit, built by Allis-Chalmers Company, was completed early in January and test runs have been successfully made during the past few weeks, Budd said.

The new unit is the fifth to be installed in the Joliet power station and it more than doubles the plant's power production capacity. The four units previously installed have a combined capacity of 75,000 kilowatts. The new 107,000 kilowatt unit marks the second boost in the plant's capacity since 1941 when a 25,000 kilowatt unit together with its modern high pressure boilers was superimposed on the three older units, thus modernizing the then existing plant.

One of the largest construction projects in the area, as many as 1,000 men were employed at times during the past two years in building the plant addition and related facilities.

The project is so designed that additional capacity can be added when needed in the years ahead. Many of the basic facilities now installed have suffi-

cient capacity to serve future units, having been designed for ultimate maximum use more advantageously and economically. Such facilities include a new dock wall and coal storage and handling equipment.

"All of the new station facilities are of the most modern type," Budd said. "The new turbine is powered from two huge boilers, each of which is equipped with three cyclone furnaces to efficiently burn crushed rather than powdered coal.

"Two huge bunkers atop the boilers each have a capacity of 1,000 tons of coal, enough to run each boiler at its full rating for a period of 28 hours—or, to put it another way—enough to heat the average home for about 200 years."

With the new unit in service, the Joliet power plant will use about 1,500 tons of coal a day. The enlarged coal storage yard adjoining the station has a capacity of approximately 250,000 tons.

The new unit consumes less coal per kilowatt-hour than the four older units in the station and is the most efficient condensing turbo-generating unit installed to date by the company. Both the steam pressure of 1250 lbs. psi and the temperature of 1000° F. will be the highest of any Public Service Company unit now in operation.

For handling of coal barges, a new dock wall was built adjacent to the station along the south bank of the Illinois waterway.

Contractors Predict Fierce Competition, Peak Volume Of Construction in 1950

What may be the fiercest competition since the middle 1930's appears to be prevailing in the general contracting industry in the construction of buildings, highways, railroads, public utilities, dams and other engineering projects.

A large volume of work is coming on the market, indicating that 1950 can be another year of a record volume of construction activity on a national scale.

Construction costs have stabilized or are tending to stabilize at approximately 10 per cent below the peak of 1948. There appears little likelihood of a drastic change in cost trends immediately.

Contractors report an adequate supply of materials, machinery and manpower generally, with continued increases in labor productivity and efficiency of contracting organizations.

These are the principal facts resulting from a survey of current construction conditions conducted by The Associated General Contractors of America.

The survey was conducted among the A.G.C.'s 110 local affiliated organizations, and among its directors, throughout the United States and in Alaska, representing more than 5,500 leading firms which annually perform an estimated 80 per cent of the nation's contract construction.

Building construction costs, for industrial, commercial and large scale residential projects, were reported to have largely stabilized at an average 8.5 per cent below the peak.

Highway construction costs, including airports, were reported at an average 12.8 per cent below the peak, with decline in costs continuing in many areas.

Heavy construction costs, for railroads, bridges, dams, waterworks and other similar type projects, were reported stabilized at an average 10 per cent less.

While 1949 was a year of marked competition, the survey replies indicated that 1950 has ushered in a period of extreme competition, with some instances cited of more than 30 bidders on one job.

Contractors were cutting overhead expenses to the bone to achieve peak efficiency and stay in the competition.

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WSE Applications

In accordance with the By-laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Junior, Member, Associate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for

admission, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RA ndolph 6-1736.

- | | | |
|---|--|--|
| 354-81 Dino R. Marcon, Project Superintendent, S. N. Nielsen Company, 3059 W. Augusta Blvd. | 369-81 Herbert C. Schmidt, Partner, H. L. Dovell & Co., 332 S. Michigan Ave. | 384-81 Wayne W. Nestander, 1910 W. 64th St., attending Illinois Institute of Technology. |
| 355-81 Richard E. Pages, 7125 S. Artesian Ave., attending Illinois Institute of Technology. | 370-81 Charles W. Thorson (Trsf.), Engineer, Joseph Goder Incinerators, 5121 Ravenswood Ave. | 385-81 Harry J. Spitzer, Jr., 3342 W. Warner Ave., attending Illinois Institute of Technology. |
| 356-81 Albert Rootberg, Senior Draftsman & Designer, Pure Oil Co., 35 E. Wacker Dr. | 371-81 Wilford G. Winholtz, Executive Director, South Side Planning Board, 2018 S. Calumet Ave. | 386-81 Walter E. Froh, Executive Vice President, Hecker and Company, Inc., 59 W. Marquette Rd. |
| 357-81 Walter J. Zapfel, 2036 W. 68th St., attending Illinois Institute of Technology. | 372-81 Eugene S. Brown, Assist. Watch Boiler Room Eng., Commonwealth Edison Co., 1111 W. Cermak Rd. | 387-81 John F. Lindeman, Jr., Contracting Engineer, Chicago Bridge & Iron Co., 332 S. Michigan Ave. |
| 358-81 John C. Liewehr, 6110 North Ave., attending Illinois Institute of Technology. | 373-81 Edward Flisak, 5657 S. Throop St., attending Illinois Institute of Technology. | 388-81 Homer R. Soyster (Trsf.), Civil Engineer, Robt. R. Anderson Co., 4550 W. Patterson Ave. |
| 359-81 Herbert R. Kaiser, Chem. Eng.-Sales, Podbielniak, Inc., 341 E. Ohio St. | 374-81 Morton Peltzman, 3254 S. Michigan Ave., attending Illinois Institute of Technology. | 389-81 James H. Towle (Trsf.), Electrical Engr., City of Chicago, Dept. of Public Works, City Hall. |
| 360-81 Nathan G. Klein, Sec. & Gen. Mgr., All Bright Elec. Prod. Co., 3917 N. Kedzie Ave. | 375-81 Ralph A. Staschke, 5007 S. Karlov Ave., attending Illinois Institute of Technology. | 390-81 Fred Best, Engineer, Factory Eng. & Des.-Struct., Western Electric Co., Hawthorne Station. |
| 361-81 John A. Lewis, Partner-Design Engr., Harry L. Dovell & Co., 332 S. Michigan Ave. | 376-81 John W. Bright, Superintendent & Engineer, City of Chicago, Dept. of Streets & Elec., 405 W. Chicago Ave. | 391-81 Joseph Halley, 6349 S. Bishop St., attending Illinois Institute of Technology. |
| 362-81 Nicholas L. Markezich, Watch Boiler Room Engineer, Commonwealth Edison Co., 1111 W. Cermak Rd. | 377-81 Paul C. Gross, Superintendent of Construction, J. T. Ryerson & Son, 2558 W. 16th St. | 392-81 Douglas R. Jenkins, Engineer, Public Service Company of Northern Illinois, 72 W. Adams St. |
| 363-81 Sam Moses, Sales Engineer, Ashland Electric Co., 752 Milwaukee Ave. | 378-81 Raymond A. Wilke, 4710 N. Spaulding Ave., attending Illinois Institute of Technology. | 393-81 Edward G. Rohn, Jr., 1032 Gunderson Ave., Oak Park, Ill., attending Illinois Institute of Technology. |
| 364-81 Simon Rotberg, Partner, Harry L. Dovell & Co., 332 S. Michigan Ave. | 379-81 Frank P. James (Rein.), Staff Engineer, Commonwealth Edison Co., 72 W. Adams St. | 394-81 Paul Stiefel, 5455 S. Blackstone Ave., attending Illinois Institute of Technology. |
| 365-81 William Jones, General Supervisor-Service, Oxweld Railroad Service Co., 230 N. Michigan Ave. | 380-81 Robert J. Schellner, Mechanical Engineer, Western Electric Co., Inc., Hawthorne Station. | 395-81 Charles Widell, Owner, 1902 S. Western Ave. |
| 366-81 Reno A. Niles, Mgr., Constr'n. & Eng. Depts.-Sales, Standard Oil Co., 910 S. Michigan Ave. | 381-81 Bernard T. Feery, Sales Engr., Webster Manufacturing, Inc., 343 S. Dearborn St. | 396-81 Frank Grossman, Chicago Sales Representative, Glamorgan Pipe & Foundry Co., 122 S. Michigan Ave. |
| 367-81 Frank J. Senese, 512 E. Healey, Champaign, Ill., attending University of Illinois. | 382-81 James D. Josephs, Junior Engineer, Bureau of Streets, City of Chicago, City Hall. | 397-81 Steven J. Kownacki, Mechanical Engineer, Division of Water Works Design, City of Chicago, City Hall. |
| 368-81 John Farquhar, Jr., Engineer, Peabody Coal Co., 231 S. LaSalle St. | 383-81 Joseph A. Radich, 6140 S. Hermitage Ave., attending Illinois Institute of Technology. | |

(Continued on Page 29)

Control of Mississippi Coming

Man's effort to control and contain the floods of the Mississippi River are approaching completion, Brigadier General P. A. Feringa, President of the Mississippi River Commission, Vicksburg, Miss. told civil engineers at the 97th Annual Meeting of the ASCE.

Speaking before the Construction Division of ASCE, he recalled that in 1879 Congress created the Mississippi River Commission to formulate plans to permanently locate and deepen the channel of the river, protect its banks, improve it for navigation, prevent disastrous floods, and promote and facilitate commerce. Now, 70 years later, the river below Cairo, Illinois, is nearly contained between levees totaling 1,580 miles in length. By the end of the present fiscal year levee construction will be three-fourths complete.

When maximum floods on the Mississippi synchronize with maximum floods on its tributaries which together drain 1,240,000 square miles or 41 per cent of the area of the United States, 3,000,000 cubic feet of water each second will flow in the river below the mouth of the Arkansas. At New Orleans, the channel

of the river will safely carry no more than 1,250,000 cubic feet per second, General Feringa pointed out. One of the major problems confronting the Commission has been to build overbank floodways to carry off, before they reach New Orleans, floods in excess of the safe capacity of the river channel there. The Bonnet Carre Floodway above New Orleans, designed to take care of 250,000 cfs, discharges easterly into Lake Pontchartrain. It has been completed and was operated during the floods of 1937 and 1945. Thus the Mississippi River, plus the Bonnet Carre Floodway, will take care of one-half of the design flood. The remainder must find its way to the Gulf of Mexico through the Atchafalya Basin, to the west. Through the west bank of the river, the West Atchafalya Floodway has been completed to carry 250,000 cubic feet per second to the Gulf. Atchafalya River itself will handle another 650,000 cubic feet per second of flood and the Commission has under construction the huge Morganza Control Structure which will have a capacity to divert another 600,000 cubic feet per second, out of the river into the

Navy Pier Engineers To Hold Open House

The College of Engineering at the University of Illinois' undergraduate division at Navy Pier, will again set up elaborate displays for the thousands of visitors who are expected at the school's second annual Open House to be held April 19 and 20.

In an attempt to show the public the modern trends in engineering education, exhibits will involve actual classroom techniques in melting, pouring, and molding of hot metals. Core-making and sand testing will be exhibited.

In addition, a demonstration in welding, and the operation of precision machine tools will show shop students in action.

Atchafalya Basin. These tremendous structures will draw off floods which would endanger New Orleans. The entire Atchafalya Floodway, including the big Morganza Floodway, General Feringa stated, will carry 1,500,000 cubic feet per second, or half the Mississippi River in flood stage. Completion date is seen for 1953.

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CTA Problems And Policies

(Continued from Page 6)

During the last three months of 1949, the CTA reduced by a total of \$1,169,203 its deficit in depreciation reserve, which is set aside to replace equipment when it has served its useful life. This reduction in the depreciation reserve deficit was at the rate of almost \$390,000 a month.

One of the economies is the substitution of one-man vehicles for two-man vehicles. That this gives substantial economy in operating costs is obvious.

Chicago is the nation's last stronghold of the two-man streetcar. Many of the larger local transit systems, and practically all of the smaller companies, operate one-man vehicles exclusively. Chicago is the only city in the United States that has bought two-man streetcars during the last twenty years.

The management of Chicago Transit Authority, the General Manager and his staff, are doing an excellent job in carrying out the policies of Chicago Transit Board. The General Manager,

assisted by the operating staff, is making an earnest and sincere effort to provide Chicago with good, modern local transit service; he is going about the job in an orderly, business-like manner, and is making good progress.

It may very well be that here in Chicago will be answered this question, which the entire transit industry has been asking itself for years: "Can modern, attractive, safe and convenient local transit be self-supporting at practicable rates of fare?" It is still too early to say what the answer will be, but we sincerely hope it will be in the affirmative.

WSE Applications

(Continued from Page 27)

- 398-81 Walter L. Raucher, Junior Engineer, Testing Dept., Commonwealth Edison Co., 2233 Throop St.
- 399-81 Harry W. Snyder, Dist. Plant Engineer, Illinois Bell Telephone Co., 212 W. Washington St.
- 400-81 Joseph R. Turek, 4217 W. Culbertson St., attending Illinois Institute of Technology.

- 401-81 William S. Chaves, 11432 S. Lowe Ave., attending Illinois Institute of Technology.
- 402-81 Kenneth L. Theobald, Gallaher & Speck, Inc., 546 W. Harrison St.
- 403-81 Fred P. Sener, Junior Engineer, Commonwealth Edison Co., 2233 S. Throop St.
- 404-81 John R. Williams, District Manager, The Electric Products Co., 407 S. Dearborn St.
- 405-81 Albert P. Ready, Resident Engr. Supt. of Const., A. J. Boynton & Co., 58 E. Washington St.
- 406-81 Henry J. Klemchuk, Mechanical Engineer, City of Chicago, Water Works Design Div., R-402 City Hall.
- 407-81 Duke A. Lord, Dist. Plant Supt., Illinois Bell Telephone Co., 212 W. Washington St.
- 408-81 Joseph H. Heuer, (Design-Consulting), 5 S. Wabash Ave.
- 409-81 Raymond D. Berry, Vice President, Gallaher & Speck, 546 W. Harrison St.
- 410-81 John V. Scott, Assistant Engineer, Commonwealth Edison Co., 72 W. Adams St.

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Reviews of Technical Books

Available at WSE Headquarters

Radio Receivers

Radio Receiver Design by K. R. Sturley, John Wiley and Sons, New York, 1948. 480 pp., \$5.50.

This book is Part 2, the first section having been published in 1943. Part 2 deals with audio frequency amplifiers and television and frequency modulated receiver design.

The author is head of the Engineering Training Department of the British Broadcasting Corporation. While there is some difference between British and American terminology in radio, the book is very readable. After all, theory and mathematics are quite universal.

The author has avoided using tube type numbers, having used descriptive names instead, thus not limiting himself to British types. A wide range of circuit variations is described and American engineers will find much of interest in such of them as are not in use in this country.

The book is well organized with an excellent table of contents making the material convenient to use.

J.A.S., WSE

Timber Engineering

Modern Timber Engineering by W. Fleming Scofield and W. H. O'Brien, Southern Pine Association, New Orleans, Louisiana, 1949. 147 pp. \$1.50.

This is a short practical handbook, which will be useful on the shelf of structural engineers. It will also help an engineer not specializing in building design to acquaint himself with the problems of timber structures. Characteristics of wood, preservatives, and fire-retardant treatments, permissible stresses, design procedure for wooden members and their connections are ably presented, as well as composition assemblies with concrete and steel members and the principles of glued laminated structures. About half the space is given to practical examples.

E.C.M., WSE

Electronics

Electronics in Engineering by W. Ryland Hill. The McGraw-Hill Book Co., New York, 1949. 274 pp. \$3.50.

Elements of electronics for general engineering applications are presented in this book. It was written specifically as a text for a background course in electronics, for students in the fields of aeronautics, industrial and mechanical engineering, and other non-electrical fields. It appears to fulfill this purpose well, since the material included is both basic and relevant.

Starting with a review of atomic theory, it proceeds to discuss in logical sequence dry rectifiers, emitters, diodes and higher types of vacuum tubes, with illustrations of simple applications. The principles of combining these and other electrical components into control circuits, amplifiers, oscillators and measuring devices are then presented, and chapters on the cathode ray oscilloscope and electro-mechanical transducers complete the text.

The treatment is descriptive for the most part, with most of the necessary quantitative data being presented in graphic rather than mathematical form.

W.F.L., WSE

TV Magnifiers

Television Picture Projection and Enlargement by Allan Lytel. John F. Rider, Inc., New York, 1949. 179 pp.

As a source of practical information concerning applications of magnifying lenses to television receivers, this book may be of interest to a number of WSE members. It discusses the oil-filled, Fresnel and other types of magnifiers which are commercially available, with a brief and elementary explanation of their operation.

Optical projection systems used with television receivers for home and theater are covered briefly in similar style.

W.F.L., WSE



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Selection of Personnel

Personnel Selection, Test and Measurement Techniques, by Robert L. Thorndike, John Wiley and Sons, Inc., New York, 1949. 538 pp. \$4.00.

Many engineers who have assumed positions in personnel work will find this book of practical value, since it deals with the selection of the most desirable individuals from among the applicants for jobs.

It consists of two parts, the first eight chapters covering the technical problems of establishing a selection program and appraising its effectiveness, and the last three chapters dealing with the administrative problems of maintaining the program. It supplements and probably will be used in conjunction with industrial psychology and statistics texts. Procedures for validation of results with an explanation of the underlying logic and mathematics involved are included and may be found by the research worker to apply also to some phases of personnel work other than pre-employment measurements specifically covered by the text.

K.K.K., WSE

Radio Transmission and Reception

F-M Transmission and Reception, by Rider and Uslan, John F. Rider Publisher, Inc., New York City, 1947. 409 pp. \$1.80.

This book devotes considerable attention to the comparative merits of amplitude-modulation, frequency-modulation and phase-modulation systems. It is one of the few books of this type that treats extensively on the transmitting as well as the receiving equipment.

With the increasing use of FM and PM in fields outside of the usual broadcast radio, an ever-increasing number of engineers find some knowledge of this medium a requisite in their designs and plans.

This book is divided into sections covering transmitters, receivers, antenna systems and servicing.

J.A.S., WSE.

D-C Machinery

Direct-Current Machinery by Grover C. Blalock, McGraw-Hill Book Co., New York, 1947. 367 pp., \$3.75.

Though it is generally assumed that the use of direct current machinery is declining, its sale volume, as compared with the sales volume of alternating current machinery, has shown a decided gain within recent years. Erratic loads are readily handled with d-c motors and such motors are in demand for traction service, elevators, etc. Many of the metal refineries and plating plants use large quantities of d-c.

This volume is concerned with the application of d-c machinery rather than its design. Design is considered only to the degree necessary for an understanding of use and control of such machinery. Diagrams and mathematics are simple, and the treatment is concise and clear. Practical problems and good illustrations help the readability. An excellent list of visual aid films is included for classroom use.

The author is professor of Electrical Engineering at Purdue University.

J.A.S., WSE

Structural Engineering

Structural Engineering, by Joseph Husband and William Harby, Longmans Green and Co., New York, 1947. 591 pp., \$5.00.

This is the fifth edition of the book first issued in 1911, written by British authors.

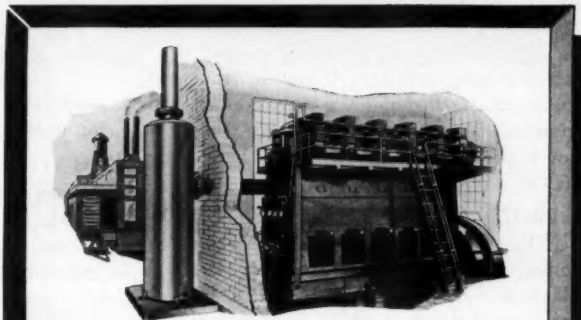
The first chapters deal with properties of construction materials, loads, working stresses, and shear and bending moments. The method of characteristic points is used in the analysis of continuous beams.

Detailed explanations, worked out with numerical examples, are given for design of steel beams, columns, plate girders, and trusses; masonry dams, arches and chimneys; and reinforced concrete beams, columns, retaining walls, and reservoirs.

The nomenclature, being British, differs from American practice, but the principles, of course, are universal, and can readily be applied by American engineers.

H.F.W., WSE

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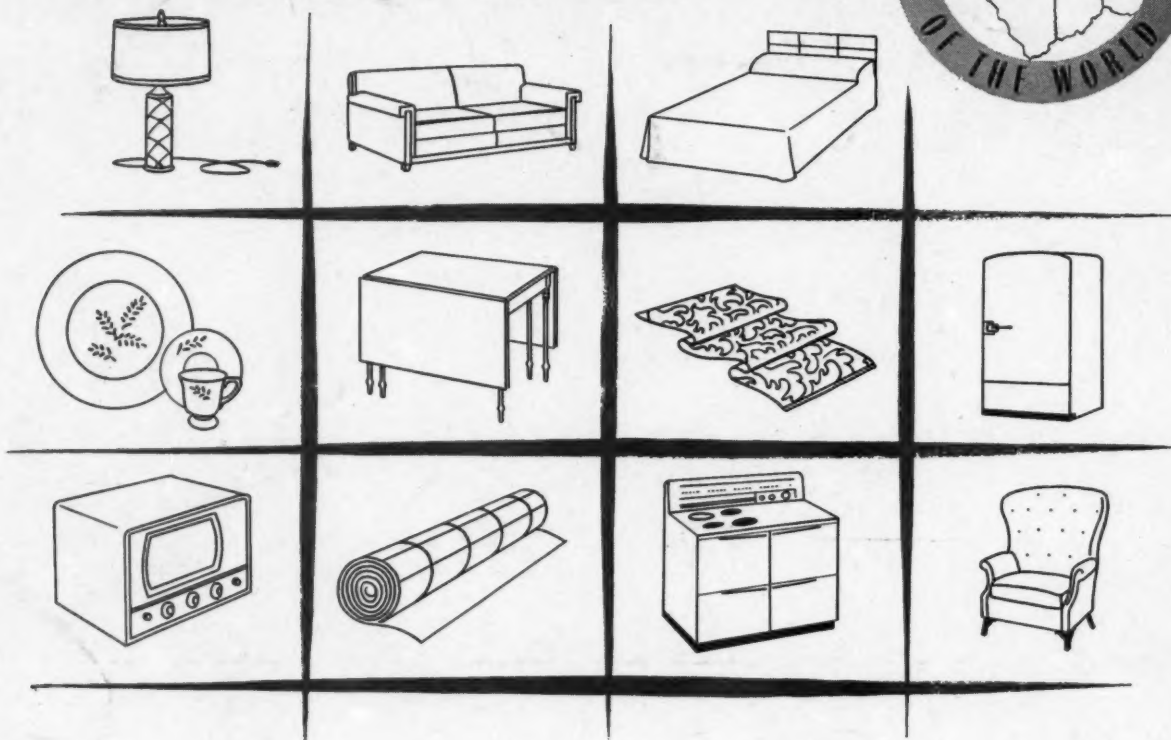
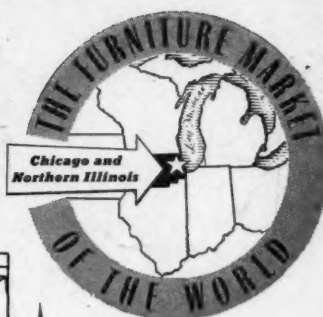
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